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ROYAL COLLEGE OF OBSTETRICIANS AND GYNAECOLOGISTS

SILVER JUBILEE—JULY 1954

THE Silver Jubilee of the Royal College of Obstetricians and Gynaecologists is being celebrated in July of this year. In the short span of the twenty-five years since its foundation the College has secured for itself a position of power and responsibility. Its foundation provided for the first time a body fitted and able to speak with authority on all matters, special and public, relating to obstetrics and gynaecology. It occupies a distinctive place amongst medical and surgical colleges in that it is the sole such corporate body in the Commonwealth. Its widely representative basis is evidenced by the fact that its 1,466 Fellows and Members include practically all the University Professors and Consultants in the subject in this country and the Commonwealth. Thirty-eight per cent of its Fellows and Members practise overseas.

Since its inception the College has been actively engaged in efforts to raise the standard of the art and science of obstetrics and gynaecology. In these fields it has achieved a widely-recognized success. By laying down the minimum postgraduate training for candidates for the Membership—now three years in recognized appointments—the College has succeeded within one generation in raising the standards of specialist practice throughout the Commonwealth. Its Membership is now recognized by electing bodies as a qualification required by candidates for specialist and consultant status.

Further, in its desire to contribute to the raising of the standard of obstetrics in general practice the College instituted in 1934 the D.Obst.R.C.O.G. again demanding a minimum period of postgraduate experience. Since then 2,468 practitioners have obtained this hall-mark of special experience.

In many other directions the College has exercised its influence. Through its representation on the General Medical Council and the Central Midwives Board it has been concerned with the standard of training of the medical student and the midwife and its advice is sought by the Ministry of Health and other public bodies.

The Editor has pleasure in calling the attention of readers to two volumes written specially to mark the occasion of the Jubilee. *Twenty-five Years: The Story of the Royal College of Obstetricians and Gynaecologists, 1929-1954* has been written by Sir William Fletcher Shaw at the invitation of the Council of the College. The publishers are Messrs. J. & A. Churchill, Ltd. The other volume is: *Historical Review of British Obstetrics and Gynaecology, 1800-1950*, edited by Professors J. M. Munro Kerr, R. W. Johnstone and Miles H. Phillips. Senior members of the College contribute the articles to this volume, which will be published by Messrs. E. & S. Livingstone, Ltd., in July.

The Appeal Fund

Those with inner knowledge of the College have become increasingly aware over the years that its activities are gravely handicapped by the cramped conditions under which these are being carried out. These activities have for long outgrown the house gifted by the first President of the College at Queen Anne Street.

In this issue of the Journal there is an illustrated folder in connexion with the Appeal which is being inaugurated on the occasion of the Silver Jubilee. The Editor is aware that many of our readers have from other sources received notice of this Appeal but he trusts that the illustrated folder will enlist the interest of others who may be induced to contribute their active support. The aim of the Appeal is the raising of funds for the purchase of a site and the erection and endowment of the building now urgently required.

A CLINICAL INVESTIGATION INTO UTERINE PROLAPSE WITH STRESS INCONTINENCE

TREATMENT BY MODIFIED MANCHESTER COLPORRHAPHY

Part I

BY

K. VERNON BAILEY, *M.C.*, M.D., M.R.C.P., F.R.C.O.G.

INTRODUCTION

IN recent years, holding a firm belief that practically every case of stress incontinence could be cured by an adequately performed Manchester Colporrhaphy, I have personally seen fit to perform a sling suspension operation in relatively few cases and these in colporrhaphies that I had operated upon myself but in which stress incontinence persisted.

The work of Malpas, however, followed by that of Jeffcoate and Roberts has stimulated me, as it must have done many others, to look into these cases more deeply. I have, therefore, carried out a routine follow-up of some 209 cases of colporrhaphy, operated upon personally during the last 6 years, and have further operated upon 10 of these which demonstrated symptomatic and anatomical failure by a combined operation which will be described. In addition a series of new cases of prolapse with stress incontinence has been investigated. In these cases pre-operative cysto-urethrography was carried out and, where this showed the derangement characteristic of stress, the operation of colporrhaphy alone or the combined operation was carried out.

In this way my confidence in the efficiency of the Manchester operation not only to deal with prolapse, but also with any bladder irritability including stress incontinence which might be associated with it, has been re-assessed.

Jeffcoate and Roberts (1952) have said that colporrhaphy is often only of value for stress incontinence in so far as it bolsters the second line of defence tissues round the urethra and indeed that the Manchester Colporrhaphy might even be the means of producing stress incontinence if carried out in such a way as to make the vaginal wall "too tight".

One should, therefore, judge the results of colporrhaphy on a basis of:

(i) The cure of the prolapse.
(ii) The symptomatic cure of associated stress incontinence.
(iii) The anatomical results as shown by cysto-urethrography.

From this the complete or partial adequacy of the operation for cases of prolapse complicated by stress incontinence can be assessed.

The loss of the posterior urethro-vesical angle in some 80 per cent of cases with stress incontinence and the necessity for the restoration of this angle to cure the condition are two of the main facts asserted by Jeffcoate and Roberts in 1952.

In the cases of this investigation, therefore, I have endeavoured to provide answers to the following questions.

Do approximately 4 out of 5 cases of stress incontinence show a loss of the posterior urethro-vesical angle as shown by the X-ray? Does this apply before and after colporrhaphy? Is a symptomatic cure associated with a change from an abnormal to a normal angle and does a failure maintain an abnormal angle?

It has not been possible to provide exact answers in respect of the cases which were operated on prior to the introduction of routine pre-operative cysto-urethrography. In the follow-up of such cases, if a symptomatic cure is recorded, there is no evidence that the urethro-vesical angle was abnormal before operation. On the other hand, if symptoms of stress incontinence persist, the absence of a pre-operative

X-ray does not invalidate conclusions drawn from cysto-urethrography during the follow-up studies.

The corollary to this concerns the advisability of a further operative procedure in certain selected cases—that is cases in which colporrhaphy has already been performed but stress incontinence persists (and is confirmed by X-ray), and new cases of prolapse with demonstrable stress incontinence and a confirmatory cysto-urethrograph.

This is important as the cure of prolapse alone represents a partial result only and indeed from the patients' view-point might constitute a failure.

Certain cases are of course atypical in so far as these patients either complain bitterly of stress incontinence when none is demonstrable or vice versa. Occasionally the X-ray appearance is at variance with the complaint. The 8 such cases in the follow-up series were subjected to precise neurological and urological investigation but no pathological lesion was found.

Many authorities consider that a more extensive operation than the vaginal plastic is not indicated except where a previous failure is recorded. These views are clinical and are not based upon a knowledge of the pre- and post-operative appearance of the bladder which presumably is the vital factor. A trial by colporrhaphy can hardly be the correct scientific procedure.

Moreover, there is a tendency to minimize to a certain extent the seriousness of the symptom of stress incontinence, in so far as it does not represent a direct menace to life or a gross pathological manifestation. The severe nervous and psychological factors, however, must be taken into account. These have the power to revolutionize the nervous condition and social life of the individual. Moreover, the vulvo-vaginitis and pruritus which can complicate cases of longstanding stress incontinence is a pathological factor of some importance.

I feel that in the past one has taken into account too little that reticence on the part of patients who willingly complain of prolapse symptoms but refrain from mentioning those relating to stress incontinence. My own feeling is that a more extensive operation should not of course be carried out except in those cases in which pre-operative investigation shows that colporrhaphy alone is not likely to result in a cure—and the main purpose of this enquiry is directed to this end.

The Follow-up Series

It is probable that most gynaecologists lose sight of their colporrhaphy results as the years go by. This fact was well demonstrated to me as the result of my follow-up of these 209 cases. The answers that the patients gave to the questions submitted indicated that, whereas perfect results were the rule in pure prolapse cases, some of the cases of stress incontinence were not cured or were not completely cured. Some patients "felt much better" than they had been because of the cure of the associated prolapse and were "putting up" with the bladder symptoms which were in many cases "not so bad" as previously. None the less, in many instances a complete cure was absent. One was, therefore, impressed with the fact that cure had been presumed unjustifiably.

A follow-up was carried out involving 209 cases who had been operated upon during the last 6 years for prolapse with or without stress incontinence by the Manchester Colporrhaphy.

In a follow-up of this kind it is satisfactory to have an adequate number of cases to demonstrate the relevant points. It is, however, impracticable to contact patients after a certain length of time and moreover the evidence, possibly vitiated by intervening years and disease, is not reliable. A pool of some 850 cases operated upon in my unit during this time was taken. Of these, 645 had been done by myself, and of these 209 presented themselves for interrogation and examination. This figure seems small in comparison with what one would like. I found, however, that it proved comprehensive enough in so far as the answers, questions, examination findings and cystograms seemed to run along fairly uniform lines and greater numbers of patients, therefore, would only be likely to further emphasize this.

As the result of conducting this follow-up, however, I discovered the incidence of both partial or severe stress incontinence to be much greater than I had imagined. My series shows

that this symptom in greater or lesser degree was present in 83 of the 209 cases before operation. This proportion would undoubtedly have been less had all the cases written to presented themselves. A card printed with the various questions and tests was used for questioning and this of course was done personally.

All the 209 cases with the exception of 2 in whom there was some recurrent cystocele stated that the prolapse symptoms were cured. Of the 83 cases concerned some stated that the stress incontinence was cured, some that it was partly relieved but still present and some that they were no better.

Eighty-three cases with stress incontinence showed—32 symptomatic cures; 20 part cures; 31 failures.

There were no cases in this series who complained of stress incontinence only after colporrhaphy. There were thus 51 failures in 83 cases and these were further investigated by tests for demonstration, vaginal examination to exclude local pathology, cystoscopy, bacteriological examination of the urine, and in 6 cases a full neurological and urological examination was carried out with negative results.

Cysto-urethrography was carried out in these cases by the method described by Roberts, the results being as follows:

Thirty-two cases of symptomatic cure showed: 29 normal X-rays, 1 gross loss of P.U.V. angle on straining, and 2 partial loss of P.U.V. angle on straining.

These 3 atypical cases may be experiencing a temporary cure owing to a partial uplift and strengthening of the distal urethra.

Fifty-one cases of symptomatic failure showed: 34 with gross loss of P.U.V. angle, 10 with partial loss of P.U.V. angle, and 7 with a normal type angle (Figs. 1, 2, 3).

It is an interesting fact that the 10 cases showing this second type of film largely coincide with those 20 cases associated with a part cure. I feel that some of these appearances—the short angle with the uplifted bladder base particularly —represent the probable presence of thin scar tissue in the region of the urethro-vesical junction, the effect of imperfect healing due in part to the effects of local strain.

The 7 cases showing the normal angle had all a gross downward rotational descent of the upper urethra. The angle was maintained but one must remember that these cases had previously suffered stress incontinence and the trauma which induces it.

The final follow-up classification, therefore, representing the results of colporrhaphy is as follows:

83 cases showed: 32 symptomatic cures with 29 normal X-rays.
51 symptomatic failures with 44 abnormal X-rays.

This series, therefore, bears out the strong relationship which exists between the symptoms as expressed and verified and the cysto-urethrograph findings, and although the unknown factor of a pre-operative X-ray and the reliability of the patient's description of symptoms must be taken into account, these results might fairly indicate the ultimate effect of colporrhaphy on stress incontinence.

The New Series

In this series there are 215 new cases of prolapse, in which 83 cases complained of stress incontinence and in which a complete examination has been carried out before operation and a cysto-urethrograph taken. The object of this is:

(i) To find out to what extent the Manchester Colporrhaphy can effect a cure and restore the posterior urethro-vesical angle where this is lost.
(ii) To find what symptomatic-anatomical results can be obtained by the combined operation in these cases not previously operated upon.

As yet only 60 cases have been operated upon in this series, but enough I believe to indicate the type of result to be expected. A control series of 25 mixed cases have been operated upon by colporrhaphy only. A series of 35 cases (25 new and 10 follow-up) with stress incontinence have been operated upon by combined operation.

To obtain the immediate results a cysto-urethrograph has been carried out between 1 and 4 months after operation, and another cysto-urethrograph will be done in 2 years' time.

The immediate results are as follows:

The Control Series

This series represents 25 cases made up as follows: 15 with no complaint of stress incontinence and a normal cysto-urethrograph, 10 with stress incontinence and a positive cysto-urethrograph.

The usual colporrhaphy with urethral bolster technique was performed and the results are as follows:

The prolapse was cured in the 15 cases with no stress incontinence and X-ray showed little or no change in the bladder appearance. In some cases, however, a further degree of uplift to the bladder base and urethro-vesical junction is discernible.

In the 10 cases with stress incontinence there were 4 symptomatic cures with normal cysto-urethrographs; 2 part cures with an improved cysto-urethrograph; 4 symptomatic failures with abnormal cysto-urethrographs.

There is no doubt about these colporrhaphy cures in that the posterior urethro-vesical angle has been virtually completely restored and moreover the urethro-vesical junction has been definitely elevated. The symptom has also, for the time being at any rate, been cured.

In my view this has been brought about by the approximation of the medial aspects of the pubo-coccygei, either directly by catching them or their offshoots, to the lateral aspects of the vaginal wall in the suture on each side, or by dragging them together indirectly with stitches widely placed. This results in replacing them infero-laterally to the bladder neck and, after the completion of the anterior colporrhaphy, in re-instituting to a certain extent the intimate contact between the bladder neck, the pubo-coccygei and vaginal wall.

I believe that such a result is possible only in those cases in which the pubo-coccygei are present in sufficient degree and extent. It is not possible where they are severely traumatized or attenuated. In any case such approximation in the coronal plane of the body is across the line of their fibres which is antero-posterior and of course this bolster, must, if it heals firmly, which is not very likely, maintain the whole strain on this area without the assistance of the supero-lateral supports to the bladder neck. There is no doubt, however, that the posterior urethro-vesical angle can be completely restored by colporrhaphy with urethral bolster—whether it be temporary or not—and this fact must surely show that the maintenance of this angle is vitally concerned with the integrity, normal structure and tone of the pubo-coccygei and their extensions to the vaginal wall and vagino-urethral area.

In other cases of this control series it can be shown that the colporrhaphy produces varying degrees of uplift to the region of the urethro-vesical junction, and no doubt this will result in varying degrees of cure of the symptom. Two cases showed this particularly. Here a typical immediate part cure was secured, both symptomatic and anatomical (Figs. 4, 5, 6, 7, 8, 9, 10, 11).

In all these cases, where the angle is normal to begin with and in others where it is abnormal, the effect of the colporrhaphy is always to improve the angle to some extent and in certain cases to restore it completely. In no case does it tend to disimprove it. I therefore regard those few cases in which stress incontinence is produced or presumed to be produced by colporrhaphy to be due to:

(i) The possibility that the patient did not complain of stress incontinence but only of the prolapse before the operation. As we know certain cases have this symptom without complaining of it and in others the prolapse overshadows it.

(ii) The placing of deep and wide mattress stitches below the upper and lower urethra—which has the effect of shortening this region and probably dragging out an already imperfect angle.

(iii) A similar effect produced by scar tissue in this region following a gross post-operative infection.

I contend that there can be no scientific reason why an anterior colporrhaphy that heals well can of itself produce stress incontinence.

I consider that the type of case in which an anatomical cure by colporrhaphy alone might be expected is that in which a gross degree of rotational descent of the upper urethra is not already present. This would indicate fair adequacy of the supero-lateral support and a minimal degree of strain on the bolster itself.

In the part cure cases of this series it can be seen that the upper urethra still rotates downwards and the urethro-vesical junction is still below the line of the femur notwithstanding the great improvement from the pre-operative picture. In the other cases where the colporrhaphy has failed the cysto-urethrogram remains much the same. In these cases there can have been little or no pubo-coccygeus muscle within reach to re-adjust. I would, therefore, also say that the type of case not suitable for colporrhaphy alone is that in which there is gross downward rotation of the upper urethra on straining in conjunction with a loss of angle. This type of picture is of course associated with severe stress incontinence and would indicate a gross degree of trauma to both upper and lower supports.

The Modified Colporrhaphy

It appears, as the result of the follow-up, that colporrhaphy alone effects an ultimate or permanent cure in some 32 out of 83 cases of stress incontinence. An additional operative procedure, therefore, seems to be warranted in selected cases. This should reproduce the normal anatomical state as nearly as possible and be readily performed in conjunction with colporrhaphy.

The risks attendant upon sling operations are appreciated by gynaecologists. These have been avoided in the Marshall-Marchetti operation (1949) but I believe that the necessary result should be obtained by not unduly pulling up the bladder without supporting it from below, minimizing the upslinging of the anterior vaginal wall, thus avoiding distortion of the vagina, placing fixation sutures in the fibro-muscular origin of the levator rather than the cartilaginous aspect of the symphysis to ensure permanent firmness, and additionally supporting the pelvic floor and eliminating the cystocele by colporrhaphy.

By these means a nearer return to the normal is produced, as is shown by the post-operative cysto-urethrography.

I have always held the view that even if, as Roberts suggests, the posterior urethro-vesical angle depends upon the tone of intrinsic muscle in its vicinity, its maintenance is probably vitally concerned, nevertheless, with certain immediate tissue supports which themselves enable any such involuntary muscle to function.

At dissection in this area there is evidence to show that:

(i) A prolongation from the fascial covering of the pubo-vaginalis on each side crosses to the supero-lateral aspect of the bladder neck to be inserted fanwise into it. This offshoot as it were from the transversalis fascia comes off from where the fascia covers the fibres arising from the lower area of the symphysis and blends with the muscle wall of the urethro-vesical area for about half an inch on each side thus covering the area of the upper urethra.

The supporting effect of this supero-lateral fascia to the upper urethra is obvious and I therefore believe that this structure assists in maintaining its normal upward ascent of some 20 to 30 degrees to the perpendicular as seen at cysto-urethrograph and hence supporting the region of the urethro-vesical junction.

(ii) From the medial surface of the pubo-vaginalis on each side, muscle fibres run to the antero-lateral aspect of the anterior vaginal wall at about the level of the superior aspect of the upper urethra. From the lower end of this attachment fibres appear to be directed to the infero-lateral region of the upper urethra. These muscular attachments would tend to give a degree of indirect support inferiorly to the upper urethra.

In conjunction, therefore, with the muscular and tendinous elements of the deep transverse perinei and triangular ligaments, which invest and support the distal urethra, the whole length of the urethra is supported and elevated (Plates A, B, C).

Direct supero-lateral and indirect infero-lateral support is thus supplied to the whole length of the upper urethra from the main base of the pubo-vaginalis muscle itself as it crosses the urethra and vagina obliquely from above downwards and backwards.

The length of the upper urethra therefore—extending for some ¾ above the lower fixed point represented by the triangular ligament—becomes

an anchored zone possessing a limited mobility which is controlled by the integrity and tone of the pubo-vaginalis fibres themselves.

These supero-lateral supports mentioned by me may not be a constant finding. Poirier and Charpy (1923) however maintain that the pelvic urethra is fixed in its position by the following extraneous supports: (1) pubo-vesical muscles, from the pubes to the anterior bladder wall in the region of the "smooth sphincter", (2) an aponeurotic sheet extending from the pubes to the region of the anterior vaginal vault, (3) a thin sheet arising from the ligamentum transversum pelvis (? triangular ligament) which clothes the anterior aspect of the urethra, (4) extensions from the aponeurosis of the pubo-vaginalis to the antero-lateral aspect of the vaginal wall, and (5) the connexions between the urethra and the vaginal wall.

Between this anchored zone and the upper fixed point represented by the transverse cardinal ligaments the bladder base and vaginal wall are in intimate contact. Relaxation of the cardinal ligaments and stretching of the vaginal wall following labour, but without excessive trauma to the pubo-vaginalis fibres themselves, could result in prolapse of the uterus with cystocele but a maintained posterior urethro-vesical angle. Varying degrees of trauma to these structures could therefore produce the variations in the cysto-urethrographic appearances which are associated with degrees of prolapse.

Both the superior and inferior supports however emanate from the pubo-vaginalis themselves. Trauma to this structure or its coverings therefore must result in a functional failure of one or both of these supports, with a resultant strain on the intrinsic musculature of the urethro-vesical junction.

I believe that laceration of the supero-lateral supports to the bladder neck will result in an abnormal downward rotation of the upper urethra on straining.

As Jeffcoate says the normal degree of descent of the urethro-vesical junction on straining is some 2 to 3 cm. It can be seen, however, in many cysto-urethrograms that the descent is much in excess of this and is associated with an abnormal downward rotation of the upper urethra above the triangular ligament. In some degrees of gross downward rotation, however, the posterior urethro-vesical angle is maintained, and often with cystocele to complicate the picture. This would indicate the continued adequacy of the inferior supports although above them the base of the bladder bulges the vaginal wall, now stretched and inadequately supported by the cardinal ligaments and pelvic cellular tissue, as the result of labour (Figs. 12, 13, 14, 15, 16).

If, however, both the superior and inferior supports are severely traumatized the resultant descent with loss of angulation will give the typical picture associated with developed stress incontinence. In the new series this has occurred in 31 of 83 cases complaining of stress incontinence.

I therefore consider that the condition of stress incontinence is pre-disposed to by a degree of trauma which adversely affects the function of both these supports and which in all probability results in a loss of tone in the intrinsic muscles of the urethro-vesical junction which they were helping to preserve.

Any operative treatment therefore must be designed to:

(i) Offset the dragging down effects of the associated uterine prolapse and cystocele. This is done by the anterior colporrhaphy which elevates the uterus and eliminates the cystocele.

(ii) Replace as far as possible the inferior support to the upper urethra. This is done by bolstering below this area. An endeavour is made to approximate any muscle or fibrous elements of the pubo-coccygeus at about 1½ inches above the urethral meatus.

(iii) Secondarily bolster the lower urethra by approximating below it any fibro-muscular elements of the triangular ligament.

(iv) Elevate and support the upper urethra by vagino-levator fixation.

By this means a return to something like the normal configuration should be achieved and, if these bladder neck supports mean anything, a return to a normal type angle might result.

Where I would say the colporrhaphy alone is apt to fail is that the inferior supports are alone concerned. A good and immediate anatomical

result might be obtained if there is enough of the pubo-coccygei to pull together. This, however, might not heal very strongly and where the patient is obese, as is most frequently the case, and some time has elapsed the constant strain may prove too much for this bolster. I feel, therefore, that any bolster type operation effected from the vaginal route only will not be adequate in the bad case, as sufficient and permanent elevation of the upper urethra cannot be guaranteed by this method. In a number of the follow-up series, the cysto-urethrogram shows an appearance suggestive of an initial good result, which has since receded in this way.

I also believe that the bladder neck uplift operations alone will also fail because they do not take into account the essential infero-lateral support and neglect the constant dragging effect of the cystocele.

The maintenance of upper urethra elevation and the maintenance of infero-lateral support are complementary and together effect a sustained posterior-vesical angle.

This operation is therefore based on the necessity to deal with all these needs, and in consequence the Manchester colporrhaphy must form the basis.

Operative Technique

The operation falls into three stages:

Stage 1.—The upper surfaces of the levatores ani are exposed by a midline suprapubic incision, the dissection being carried out in the loose cellular tissue of the retro-pubic space (Cave of Retzius). The origins of these muscles are displayed on each side from the body of the pubic bone to the white line of the obturator fascia. The medial fibres of the pubo-coccygei (pubo-vaginalis) are defined.

Stage 2.—A Manchester colporrhaphy is carried out following a technique described below. A number 4 Malecot self-retaining catheter is used and some 3 ounces of saline in the bladder. Opportunity is taken before closing the vaginal incision to insert on each side two "fixation sutures". These sutures will be described in detail later, but it should be understood that each suture has a loop on the vaginal skin and the two ends of each suture are carried through the levatores ani to emerge in the Cave of Retzius.

Stage 3.—After the completion of the colporrhaphy operation the vaginal phase of the operation is finished. In Stage 3 the "fixation sutures" are used to plicate and shorten the pubo-vaginalis muscles.

The position of the patient is of great importance. After trying out several expedients, I have now concluded that the competing claims for access respectively to the vagina and to the retro-pubic space may be adequately met if the patient is placed in a modified lithotomy position at the very commencement of the operation. The essential feature of the modification is to limit the degree of flexion at the hip joints. With this precaution Stage 1 is not seriously embarrassed. In Stage 2 the vaginal access is adequate, and the passage of the "fixation sutures" may be achieved readily and under the control of vision both from the vaginal and the retro-pubic operative fields. In Stage 3 it may be found to be of advantage from the point of view of access in obese subjects to drop the patient's legs to assume a mild Trendelenburg position.

The vaginal operation is simply that of the Manchester colporrhaphy technique plus the definition of the para-urethral sulcus, on each side. The main points to be observed are:

(i) A wide tapered H-shaped incision of the vaginal wall with sub-urethral extensions outwards—a "stoppered bottle" incision, which gives ready access to the bladder and lateral aspects of the membranous urethra.
(ii) Separation and pushing up of the bladder from the cervix.
(iii) Dissection of the para-urethral sulcus on each side.
(iv) Insertion of "fixation sutures". (Detail below.)
(v) Circular amputation of the cervix.
(vi) Repair of the cervix stump.
(vii) Approximation of the transverse cardinal ligaments.
(viii) Approximation of the vaginal fascia below the prolapsed bladder base—by straight transverse suture.
(ix) Light approximation of the fibro-muscular tissue below the urethra.

(x) Suture of the opposing cut edges of the vaginal wall.

After step (iii) two mattress sutures of No. 2 catgut or No. 0 silk are placed through each side of the vaginal wall so that the ends emerge on the deep surface of the flaps. These sutures are placed about 1½ inches and 2 inches from the external meatus on each side and approximately ¼ inch from the edge to get a good grip of the vaginal wall without being too close to the lateral vaginal sulcus. After the anterior colporrhaphy is complete these vaginal fixation sutures will more nearly approximate.

I carried out the first 16 of these cases by using No. 2 catgut for the fixation sutures. In 2 cases at a second follow-up X-ray examination I noticed a slight sagging of the region of the urethro-vesical junction. In the remaining cases, therefore, I have used No. 0 silk for these sutures.

There is of course a contra-indication to the use of a non-absorbable suture which passes from the vagina to the region of the Cave of Retzius. In the cases of this series, however, there has been no trouble with sepsis in this respect. I would suggest that the main reasons for using silk are as follows:

(i) This is an operation which has to be carried out in many obese subjects in whom the strain on the pelvic floor post-operatively is great. It is essential, therefore, that the fixation sutures remain firm for longer than the 12 days or so likely in the case of catgut.

(ii) There are no silk knots protruding in the vagina. These sutures present only a 2 cm. length plain strand which must sink deeply in the vaginal wall as the result of the firm upward pull after the first few days. In fact it is not possible actually to see them after completion of the operation and it is probable that they are soon covered by epithelium. It is, however, preferable to run them initially through the whole thickness of the vaginal wall so as to make use of its total strength.

I feel, therefore, that silk is likely to give the better permanent result, particularly in obese subjects. I am, however, still using catgut in some cases for further tests in this respect.

The fixation sutures are then passed, one at a time, through the levator ani from below. The suture nearer to the urethral meatus is passed first. This is done by threading the double suture through a straight needle, 4 inches long, the terminal third of which is bent at an angle of about 30 degrees. Through the supra-pubic incision the middle finger of the left hand palpates the medial border of the levator muscle as it leaves its origin from the inferior portion of the body of the pubes. The point of the straight needle, which is somewhat blunted, is introduced into the highest point of the para-urethral sulcus (farthest from the meatus), and, with its angular concavity facing inwards, and guided a little downwards and outwards its point readily contacts this finger tip above before perforating the pubo-vaginalis from below. During this procedure the bladder neck is retracted to the opposite side by the assistant. By moving to the side the exact point to pierce the muscle can be seen before doing so. The suture which has a firm wide hold through the total thickness of the vaginal wall thus travels through the pubo-vaginalis from below, approximately at about ¾ inch below and lateral to the midline. The second vaginal suture is passed if possible a little more posteriorly and more laterally, but only so as to pierce the portion of the muscle having origin at the pubes. The portion originating in the obturator fascia is too close to the side wall of the pelvis to respond to the uplift of the fixation. Similarly, in order to avoid the pudendal vessels in the region of the para-urethral sulcus the needle should avoid the bony margin as far as possible. Bleeding in my series has not been troublesome and can be controlled by the diathermy and by the sub-urethral bolster.

The colporrhaphy is now completed and the urethra is lightly bolstered by two transverse sutures including vaginal fascia and remnants of the muscular and tendinous elements derived from the inferior surfaces of the torn triangular ligament.

At this stage the gloves are changed for the vaginal sutures to be fixed supra-pubically.

The fixation area is to the region of the fibro-muscular origin of the levator on the lower lateral surface of the pubic bone. This is effected by running both lengths of each suture separately through the fixation zone and tying as a close

mattress. I find that this mattress suture should be a close one in order to ensure a firm knot in this dense tissue. By this means a firm hold is obtained through the strong fibro-muscular tissue and moreover the tissues thus brought into apposition by these sutures are all of the same muscular and fibro-muscular type and of equal density. An area of bolstered vaginal wall is in this way brought up against the levator which in turn is lifted up from the points at which it has been perforated and is therefore folded up or plicated against its own origin and against its own tissues.

By this means the anterior aspect of the levator (pubo-vaginalis) which is included in the area of the sutures—some inch or so on each side—is lifted up and firmly fixed. These three tissues involved therefore being all of the same type can be expected to unite strongly and without tendency to separate during union (Plates D, E, F, G, H).

In a number of these cases one has observed that the pubo-vaginalis muscle of one side, usually the left, is thin and deficient as compared with the other side. In 3 of my cases the left levator was seen to have been torn off its origin and retracted in a bulbous fashion away from the bone. Again in other cases the muscle is thin and lacking in fibrous firmness, and in these the fixation has to be made at a slightly higher level.

Only occasionally bladder neck veins have to be ligatured and if some oozing occurs it may be as well to drain the Cave of Retzius with a thin rubber dam for 3 days. Alternatively the abdominal incision can now be closed without drainage.

On further inspection of the anterior vaginal wall it can be seen to what extent the area concerned has been elevated, beyond that degree to which it is possible with the colporrhaphy alone, but not abnormally so. The urethra now lies along the middle of a firm flat softly padded shelf which has been elevated to support it. The bladder neck also elevated to its normal plane rests infero-laterally on the soft cushion of the plicated pubo-vaginalis and the urethro-vesical junction assumes its normal position and relation. It cannot, therefore, descend on straining. The post-operative X-rays demonstrate this well. There is, however, no undue distortion of the vagina. No kinking of the urethra is possible and no undue updrag on the bladder itself. The triangular ligament and its subsidiaries are functionally replaced by the bolstered vaginal wall. The stretched and attenuated pubo-vaginalis itself is elevated and strengthened. The bladder base also rests on the plane to which it was accustomed.

The trauma of labour has thus been repaired as far as anatomically possible (Plate J).

In those cases of my follow-up series, in which colporrhaphy has failed to cure the stress incontinence and the X-rays show a lost posterior urethro-vesical angle, the technique of the operation varies only in so far as the amount of vaginal wall to remove is now limited to that which will give adequate para-urethral access and a further degree of fibro-muscular support to the bladder base (Plate K).

In order to produce the good results, therefore, it is necessary both to support the bladder neck region from below and to elevate the upper urethra as far as possible by fixation. In this way the fixation takes the strain off the bolster and vice versa. Any operation which only does the one is likely to suffer the constant derogatory effects of failure to do the other.

The results of the operation in the new series are as follows:

In 35 cases of prolapse with stress incontinence and positive cysto-urethrography operated upon by the modified colporrhaphy there were 35 clinical cures of prolapse, 32 symptomatic cures of stress incontinence, 32 anatomical cures of stress incontinence. The 3 cases not showing a complete cure were all very obese. A symptomatic and anatomical improvement was, however, shown.

In the new series approximately 38 per cent of all cases complained of some degree of stress incontinence. Of this number about one-third showed a gross positive X-ray and modified colporrhaphy was carried out in the majority of these. One might say, therefore, that this operation is indicated in about one-third of those who complained of stress incontinence or in about 13 per cent of all cases.

In order to obtain the immediate anatomical results of this operation I have asked the X-ray Department to carry out the post-operative

cysto-urethrograph at 1-4 months in these cases. Another taken at 2 years would give the remote or probable permanent result. In the immediate results the most interesting fact is the extraordinarily accurate return to the normal posterior urethro-vesical angulation which is often present. In most of these cases this junction has been elevated and a posterior angle approximating to the normal has been reproduced. This is associated with a return to the normal length and straightness of the bladder base, and there is no kinking or other abnormal outline formed. On straining there is no abnormal descent.

The vagina which is smeared (but not packed) with barium shows elevation but no gross distortion. These results, therefore, show a fair return to the normal configuration.

I cannot think that the almost perfect posterior urethro-vesical angle which results in many of these cases is due to actual tissue which is put there by operation. Rather more it is likely that the tone of the intrinsic muscles of this region returns as the result of the elevation of the upper urethra produced by the operation (Figs. 17, 18).

It would appear, therefore, that this combined operation is indicated as an initial procedure particularly in the severe cases which exhibit a gross loss of posterior urethro-vesical angulation in conjunction with gross rotational descent of the upper urethra.

It must be remembered, however, that these satisfactory results are represented by the immediate X-ray verification. Time must elapse, say 2 years, before the end result can be assessed. One feels, however, that the firmness of the healing by this technique should be adequate to the occasion just as the immediate relief of the symptoms tends to suggest that it will be.

In the follow-up series there were 44 cases which exhibited clinical-anatomical failure for cure of the stress incontinence factor. To date I have operated upon 10 of these by the combined operation. These have had the immediate (3 months) cystogram. In these there are 9 clinical cures and 9 anatomical cures.

The immediate results in these post-colporrhaphy cases, therefore, also appear to be satisfactory.

In my view cases for modified colporrhaphy should be chosen for operation on a basis of:

(i) The age of the patient. I think that 55 years of age should in the average type approximate to the limit in this group.
(ii) The severity of the symptoms.
(iii) The type of patient. Obesity should not constitute an absolute contraindication as very many of these patients are obese subjects and these again are the ones most likely to offset the effects of a pure colporrhaphy.
(iv) A cysto-urethrograph which, in addition to a gross loss of posterior angulation, shows a marked degree of downward rotational descent of the upper urethra and consequent downward displacement of the urethro-vesical junction constitutes a definite indication for this operation.

Summary

In this enquiry I have endeavoured to clarify the position of the Manchester Colporrhaphy (with urethral bolster), in the treatment of uterine prolapse complicated by stress incontinence.

The additional operative procedure—modified colporrhaphy—is a sequel to this investigation.

Briefly the main conclusions are as follows:

(i) I have considered that the intrinsic muscles which probably maintain the posterior urethro-vesical angle are assisted to a vital extent by the supporting and controlling effect of supero-lateral tendinous supports and indirect infero-lateral muscle supports to the upper urethra. Trauma to these tissues resulting from labour affects the integrity of these structures and predisposes to stress incontinence.
(ii) The Manchester Colporrhaphy is capable of producing a cure of stress incontinence with prolapse, but probably only in cases which are anatomically favourable.
(iii) A follow-up of 209 cases showed that 32 out of 83 cases of stress incontinence were cured after 2 or more years.
(iv) A new series of 10 cases of prolapse with stress incontinence showed that 4 out of 10 cases were symptomatically and anatomically cured at 3 months by colporrhaphy alone and that 32 out of 35 cases

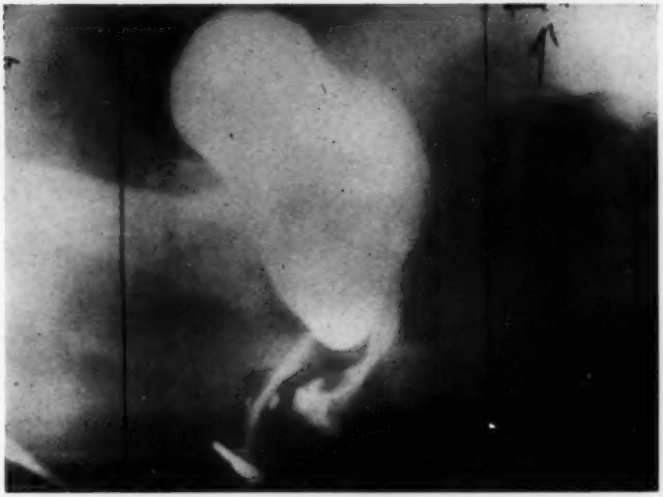

FIG. 1

Mrs. H.—Follow-up Series.

Symptomatic and anatomical cure by colporrhaphy (2 years), 29 similar cases.

FIG. 2

Mrs. S.—Follow-up Series.

Symptomatic and anatomical failure after colporrhaphy (2 years), 34 similar cases.

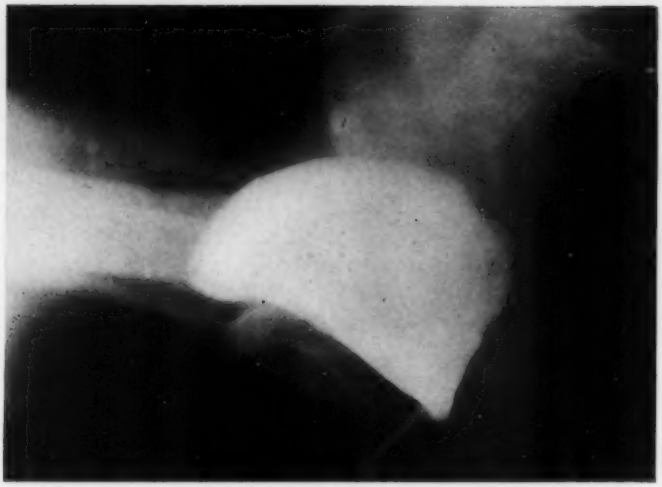

FIG. 3

Mrs. B.—Follow-up Series.

Symptomatic part cure after colporrhaphy (3 years).

The short posterior angle and marked uplift of the bladder base are present in a number of these cases and are probably an effect produced by what remains of a scarred bolster. The well supported upper urethra assists in the part cure.

FIG. 4

Mrs. P.—Control Series.

A good result with colporrhaphy only.

Before colporrhaphy the picture agrees with the presence of stress incontinence, but there is no gross descent of the upper urethra before operation.

K.V.B.

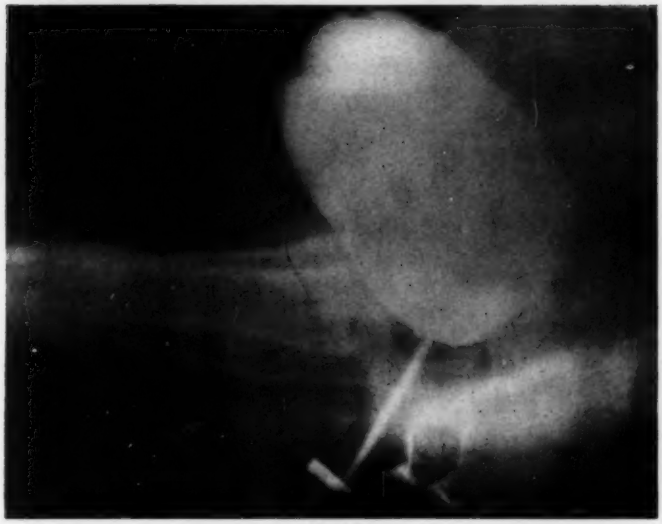

FIG. 5

After operation the posterior urethro-vesical angle is well restored by the bolster. A suitable case for colporrhaphy only.

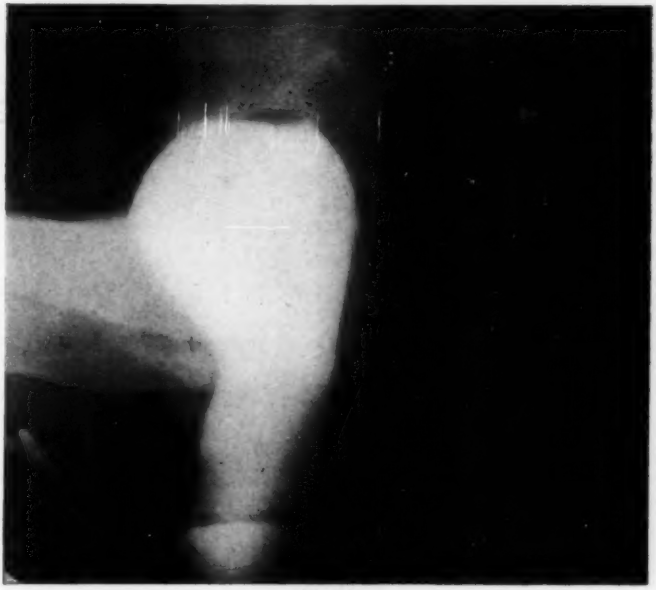

FIG. 6

Mrs. S.—Control Series.

A symptomatic part cure with colporrhaphy only.

Before colporrhaphy there is a gross descent of the upper urethra which enters the cystocele at an obtuse angle.

FIG. 7
Mrs. S.
After colporrhaphy the urethro-vesical angle is largely restored by the bolster, but there is still an abnormal degree of rotational descent of the upper urethra. This patient's symptoms are improved but she is obese. Will the bolster hold? Probably a bad case for colporrhaphy only.

FIG. 8
Mrs. C.—Control Series.
A part cure with colporrhaphy only.
Before colporrhaphy the picture agrees with the presence of stress incontinence.
K.V.B.

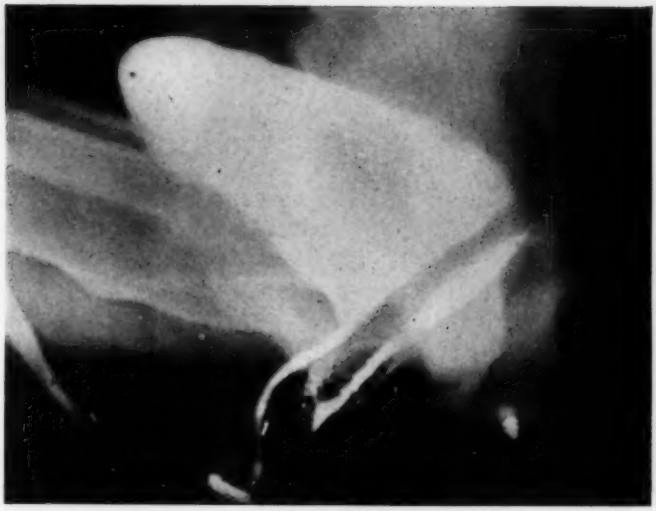

FIG. 9

After colporrhaphy there is a decided uplift to the bladder base but a failure to restore the posterior urethro-vesical angle.
This patient is better but not cured.

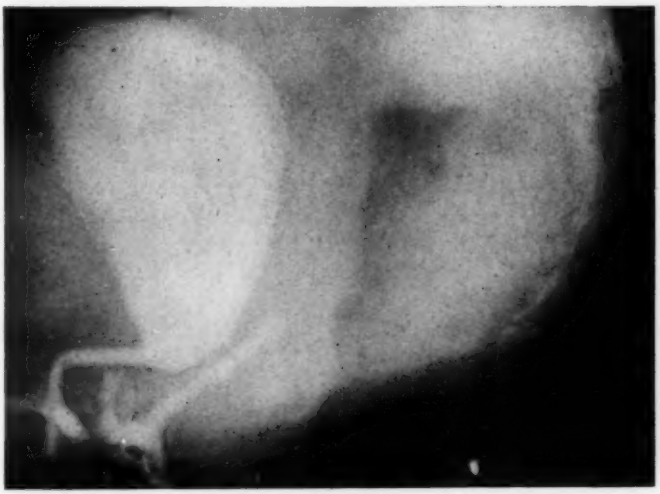

FIG. 10

Mrs. E.
Failure with colporrhaphy.
Before colporrhaphy the picture agrees with the presence of stress incontinence.

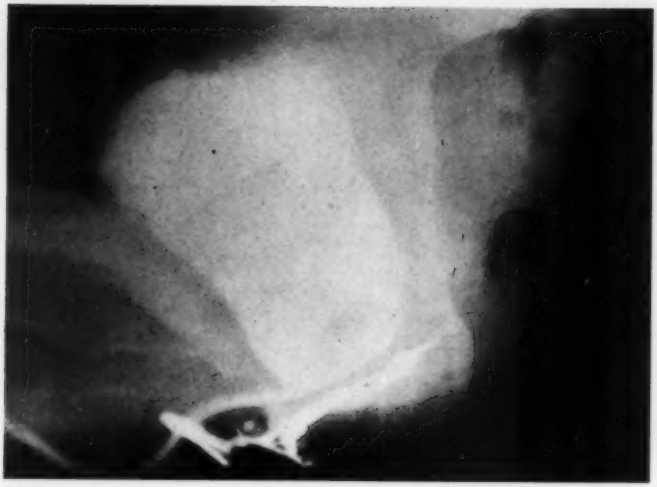

FIG. 11

After colporrhaphy there is no marked improvement. This is unusual as the bolster generally produces some degree of uplift.

FIG. 12

Mrs. B.

Loss of posterior urethro-vesical angle with a normal ascent of the upper urethra and little descent. Adequate supero-lateral supports. (Compare Fig. 8.)

K.V.B.

FIG. 13
Mrs. T.

FIG. 14
Mrs. V.

FIG. 15

Mrs. H.

Degrees of downward rotational descent of the upper urethra. In Figs. 13 and 14 the urethro-vesical angle is still normal but in Fig. 15 it has become obtuse. Inadequate supero-lateral supports with increasing inadequacy of the infero-lateral supports. (Compare Fig. 6.)

FIG. 16

Mrs. W.

Gross inadequacy of all supports.

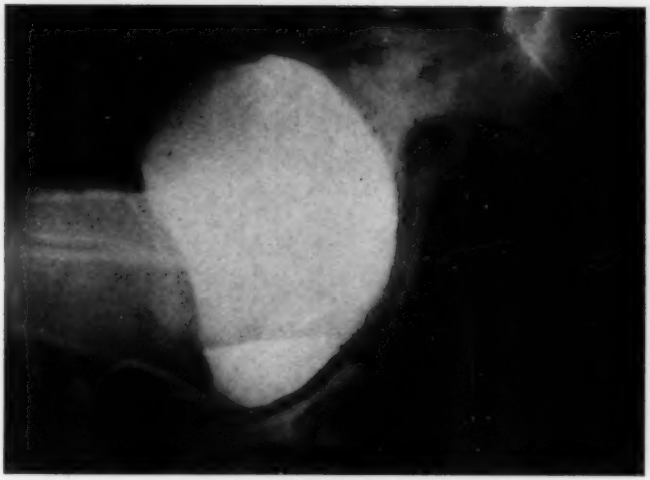

FIG. 17

Mrs. S.

Before colporrhaphy fixation the film shows gross descent with loss of angulation on straining.

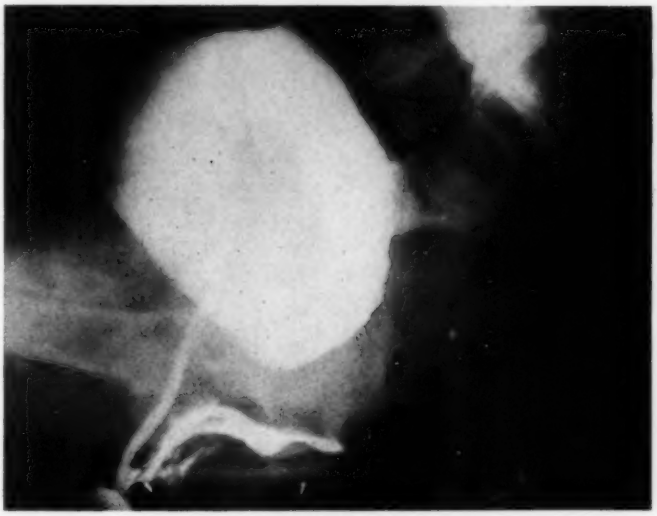

FIG. 18

After colporrhaphy fixation the posterior urethro-vesical angle is restored and the upper urethra is elevated.

K.V.B.

PLATE A

Dissection of the region of the bladder showing the short supero-lateral fascial extensions from the pubo-coccygeus to the upper and lateral aspects of the bladder neck.

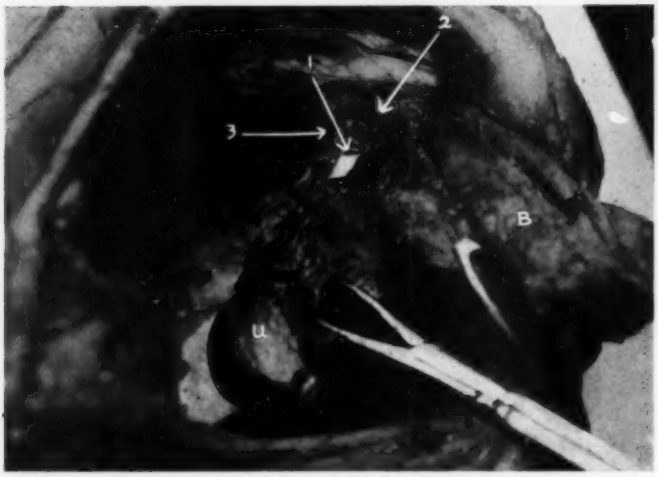

PLATE B

The infero-lateral aspect of the bladder neck showing muscle elements extending between the pubo-coccygei to the antero-lateral surface of the vaginal wall and thence upwards to the infero-lateral aspect of the bladder.

1. The marker shows the position of the vaginal fault.
2. Muscular extensions to vaginal wall and bladder neck.
3. Position of pubo-coccygeus.

K.V.B.

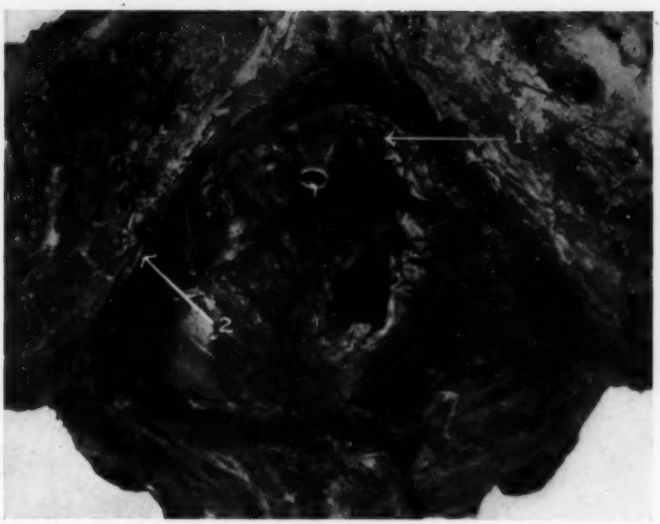

PLATE C

Perineal view showing the position of the triangular ligament and distal urethra supports. The course of the pudenal vessels is also shown.
1. Triangular ligament. 2. Pudenal vessels.

PLATE D

Stage 1 in combined colporrhaphy fixation.

K.V.B.

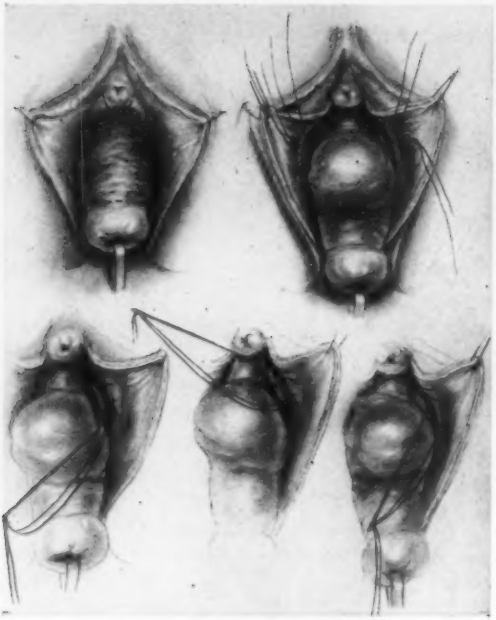

PLATE E
Stage 2 in combined colporrhaphy fixation.

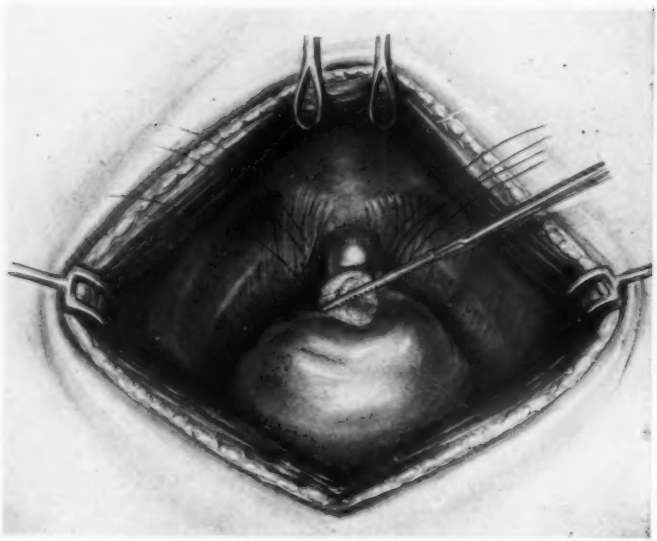

PLATE F
Stage 3 in combined colporrhaphy fixation.
Fixation sutures penetrating pubo-vaginalis.

K.V.B.

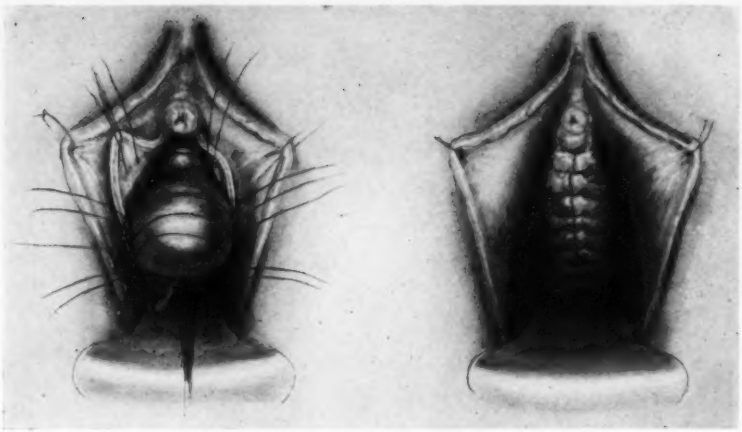

PLATE G

Stage 4.—The cervix has now been amputated.

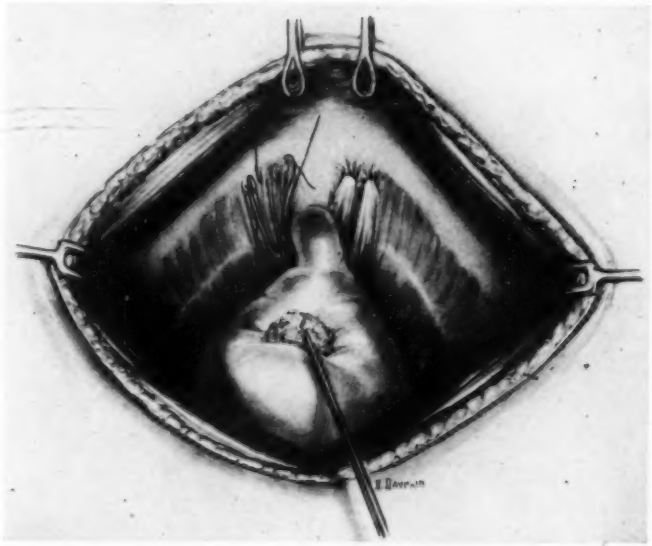

PLATE H

Stage 5.—The fixation is to the origin of the pubo-vaginalis muscles on each side.

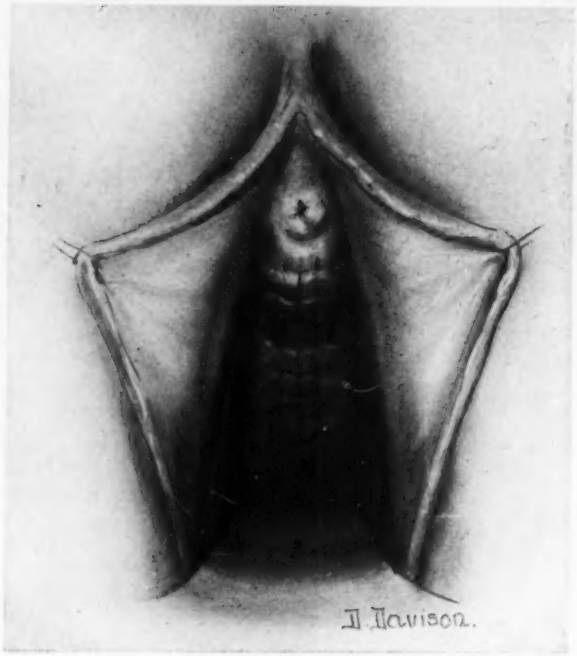

PLATE J

Stage 6.—The end result.

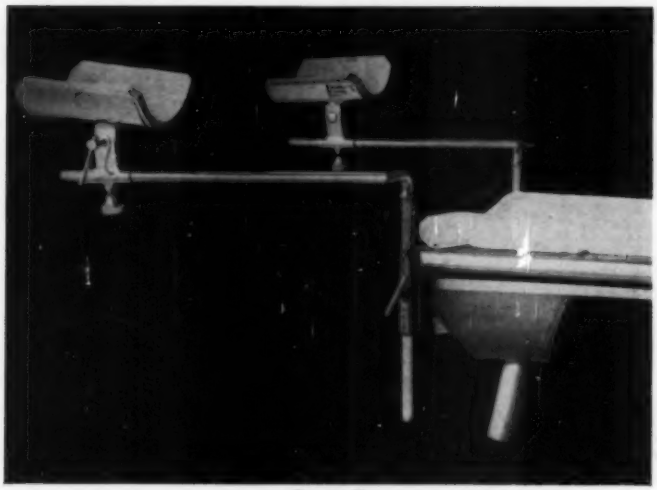

PLATE K

The modified lithotomy position.

The modified Manchester colporrhaphy.

This gives improved abdominal access with only slight limitation of the vaginal approach.

were symptomatically and anatomically cured by modified colporrhaphy.

(v) It is possible to assess with fair accuracy before operation which cases are likely to be cured by colporrhaphy alone. An attempt has been made to assess the degree of suitability of cases for colporrhaphy and modified colporrhaphy. The modified colporrhaphy is particularly indicated where there is gross rotational descent of the upper urethra in conjunction with loss of the posterior urethro-vesical angle.

(vi) The modified colporrhaphy operation is shown to be capable of restoring with fair accuracy the normal configuration of the bladder base and posterior urethro-vesical junction. This must constitute strong evidence that the posterior urethro-vesical angle is sustained at any rate in the normal way by the structural support of tissues described.

(vii) The modified colporrhaphy is indicated in approximately one-third of cases who complain of stress incontinence or in about 13 per cent of all cases.

(viii) The Manchester Colporrhaphy by curing the uterine prolapse, the cystocele and strengthening the pelvic floor, is a necessary adjunct to any operation for the support of the bladder neck zone. Without it the result would be likely to be temporary. The colporrhaphy, therefore, must remain the basis of all operations for pelvic floor trauma.

(ix) All cases of uterine prolapse in which stress incontinence is complained of should be submitted to a pre-operative investigation which includes cysto-urethrography.

Apart from my tribute to the initial work of Malpas, Jeffcoate and Roberts, without which this clinical investigation could not have been carried out, I wish to record my grateful thanks to Dr. Hartley, Dr. Rowley and the staff of the X-ray Department of Saint Mary's Hospitals for the excellent and painstaking technical work they have conducted, and their whole-hearted collaboration. I am also indebted to Mr. D. S. Poole-Wilson and Dr. G. Smyth for their help in the urological and neurological investigation of certain atypical cases. I am grateful also to Professor Mitchell for his help and guidance in the anatomical work. I also wish to thank my Registrar, Dr. Grayburn, and House Surgeons, Drs. Mathie, Dutton and Kramer for their diligent co-operation.

My thanks are also due to Dr. R. Ollerenshaw, Miss Davidson and Mr. Howarth, for the photography and illustrations.

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DEFLEXION ATTITUDES OF THE FOETUS *IN UTERO* WITH SPECIAL REFERENCE TO THE AETIOLOGY AND DIAGNOSIS OF FACE AND BROW PRESENTATION*

BY

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THE normal attitude of the foetus *in utero* is one of flexion. This is an inherent characteristic of the foetus and, except under abnormal circumstances, it is not greatly influenced by contact with the surrounding uterine wall. The importance of the deflexion attitude is that in its extreme form it gives rise to face or brow presentations which have a high foetal mortality. If these abnormal presentations were diagnosed before the onset of labour and not late in labour, as is usually the case at present, this high foetal mortality could be materially reduced.

In this essay it is proposed to review the literature relating to the aetiology of face and brow presentations, and thereby show that the views at present held on this subject are unsound. It is then proposed to establish that face and brow presentations in the normal foetus are always primary, due to excessive tone in the extensor muscles, and never due to the causes at present given in most of the literature on the subject. A summary of some recently reported cases, together with some of the author's cases, will be presented in support of this theory.

INCIDENCE

The figures for the incidence of face and brow presentation given in most current text-books are too high. This is shown in Table I where the text-book figures are shown together with comparative figures from recently published articles on this subject. It will be seen that the correct incidence of face presentation is about 1 in 500 and brow presentation 1 in 1,500-3,000.

TABLE I

Name of Textbook or Author and Title of Paper	Incidence of Face Presentation	Incidence of Brow Presentation
Queen Charlotte's Textbook of Obstetrics (1948)	1 in 360	1 in 600
Textbook of Obstetrics (Strachan, 1947)	1 in 300	1 in 1,500
Eden & Holland's Manual of Obstetrics (Brews, 1948)	1 in 300	1 in 1,500-2,000
Williams' Obstetrics (Eastman, 1950)	1 in 369	1 in 1,000
Combined Textbook of Obstetrics and Gynaecology (Baird, 1950)	1 in 250-300	Not given
Short Textbook of Midwifery (Gibberd, 1947. Figures based on Guy's Hospital Reports)	1 in 500	1 in 3,000
Face and brow presentation: the experience of the Johns Hopkins Hospital (Hellman, Epperson and Connally, 1950)	1 in 468	1 in 1,498
Face and brow presentation (Simpson, 1950)	1 in 700	1 in 829
Face and brow presentation (Posner & Buch, 1943)	1 in 529	1 in 3,543
An analysis of 45 face presentations (Posner & Cohn, 1951)	1 in 800	Not given
Face presentation: a study of 160 cases (Reddoch, 1948)	1 in 550	Not given
Face presentation (Rudolph, 1947)	1 in 576	Not given
A study of face presentation in the normal mature fetus (Tucker, *et al.*, 1950)	1 in 620	Not given

To show the high incidence of face presentation quoted in most textbooks compared with that reported in collected series of cases. The wide variation in the incidence of brow presentation is probably due to inclusion of median vertex presentations by some authors and not by others.

* Awarded the Katherine Bishop Harman Prize of the British Medical Association, 1953.

The figures given refer to those cases which are found to be face and brow presentations during labour. No reference is made to the incidence of face or brow presentations before the onset of labour, as these cases are thought to be so rare, except when the foetus is abnormal, as not to merit separate mention. This is at variance with established practice in discussing malpresentations, e.g. in breech presentations a distinction is drawn between the incidence of breech presentation and the incidence of breech delivery. The erroneous idea that face and brow presentations arise during the course of labour has led to an equally erroneous explanation of how or why this happened.

Aetiology

The aetiology of face and brow presentations as given in obstetric text-books is almost exclusively limited to those conditions which, by reducing the capacity of the pelvic brim, cause the uterine contractions to force the head into an extended attitude. It seems to be generally accepted that this only occurs during labour. The aetiological factors common to all authors are:

(1) Contracted pelvis.
(2) Placenta praevia.
(3) Cord round the neck.
(4) Tumours in the pelvis.
(5) Tumours of the neck of the foetus.
(6) Gross foetal abnormalities.

To this list authors add other causes which they consider to be of importance.

In this paper gross foetal abnormalities will not be considered further.

It is now proposed to review the literature on the aetiology of face and brow presentations. These papers fall into two distinct groups:

(1) Those which deal with face and brow presentation.

(2) Those which deal separately with each of the various factors which are considered to cause face and brow presentation.

Review of the Literature on Face and Brow Presentation

From eight reports dealing with a total of 624 face presentations and 100 brow presentations Table II has been constructed to show, as far as possible, the cause to which the malpresentation was attributed by the individual authors. This Table shows that these authors consider that 24 different conditions were responsible for face and brow presentation. This great variety of conditions is only equalled by the variation of opinion of the authors as to the relative aetiological importance of the individual conditions in their respective series.

The only consistency in these figures is that the biggest number of cases in each series is allocated to that group for which no aetiological factor could be found. It seems extraordinary that every author should, without comment, place the largest number of cases into the group for which no cause could be found. It seems reasonable to conclude from this that the main cause of face presentation has not been included in this Table.

Contracted Pelvis

In Table II it is shown that all authors give figures for contracted pelvis, yet there is the widest divergence of opinion as to its incidence in face and brow presentation.

Thus Hellman, Epperson and Connally (1950) consider that contracted pelvis was responsible for 56 or 39·7 per cent of 141 face presentations and 24 or 53·8 per cent of 45 brow presentations while Light (1950) at the same meeting had only 1 contracted pelvis in 36 cases of face presentation and 10 of brow presentation, an incidence of 2·9 per cent for face presentation and 0 per cent for brow presentation.

The accuracy of the diagnosis of contracted pelvis in Hellman's series is very questionable. Eighteen cases of face presentation and 8 of brow presentation were examined by radiological pelvimetry, 5 of face and 4 of brow showed contracted pelvis. The method of selection of cases for radiological pelvimetry is not explained, nor are the measurements given in the cases of contracted pelvis. Despite the alleged high incidence of contracted pelvis, 75 per cent of full-time pregnancies had a spontaneous or low forceps delivery. This figure alone tends to disprove the claim made by these authors of a high incidence of contracted pelvis.

Tucker, Solomkin and Abrams (1950) had no contracted pelvis in 64 cases of face presentation.

TABLE II

Author	Posner and Cohn	Posner and Buch		Rudolph	Reddoch		Tucker *et al.*	Simpson		Hellman, Epperson and Connally		Light		Total	
Presentation	Face	Face	Brow	Face	Face	Brow	Face	Face	Brow	Face	Brow	Face	Brow	Face	Brow
Number of Cases	45	72	7	61	160		64	45	38	141	45	36	10	624	100
Aetiological Factors															
1. Contracted pelvis ..	9		15	18	6		0	3	9	56	24	1		108	33
2. Large baby	7		14	12	8		0	2	5					42	5
3. Small baby—under 5½ pounds	6		—	—	18		—	4	3					28	3
4. Placenta praevia	—		4	1	1		0	1	0					7	
5. Umbilical cord round the neck	9		7	1		2	0	0	2					17	4
6. Tumours in pelvis of uterus	—		0	0	1		0	—	—					1	
7. Faulty uterine axis ..	—		—	—	4		—	2	0					6	
8. Tumours of foetal neck ..	—		0	0	—		0	—	—					0	
9. Hydramnios	1		4	—	—		—	1	0					6	
10. Dolicocephaly	—		1	0	—		0	—	—					1	
11. Occiput posterior position	—		—	—	—		13	—	—	Figures not given		Figures not given		13	
12. Secondary to brow presentation	—		—	—	12		—	—	—					12	
13. External version	—		2	—	—		—	1	1					4	
14. Bag induction of labour ..	—		—	—	1		—	—	—					1	
15. Compound presentation ..	—		0	—	3		—	1	1					4	1
16. Umbilical cord entanglement	—		—	—	—		—	—	—					0	
17. Second twin	—		—	—	1		—	—	—					1	
18. Macerated foetus	—		—	—	—		—	1	0					1	
19. Foetal monsters	7		4	7	9		—	14	0					41	
20. Pyelitis	—		—	—	1		—	—	—					1	
21. Bicornuate uterus	—		—	—	—		—	0	1						1
22. Constriction of cervix round neck	—		0	—	—		0	—	—					0	
23. Increased tone in extensor muscles	—		0	—	—		—	—	—					0	
24. Short cord	6		—	—	—		—	—	—					6	
Number of cases in which no aetiological factor could be found	10		28	22	93		51	15	16					No cause found 219	33

A table constructed to show the frequency of 24 different aetiological factors mentioned by 8 authors describing a total of 624 cases of face and 100 of brow presentation. Where the figure 0 is given it means that the author mentioned this as a factor which was not found in his series. Where the space is blank the condition has not been mentioned by that author. Note that the biggest number of cases in each series is that for which no cause could be discovered.

Posner and Buch (1943) in a series of 79 cases of face and brow presentation had evidence that one or other of 16 known predisposing factors was present in 46 cases.

Out of these 46 cases, disproportion was present in 29 cases. In 15 instances this was due to contracted pelvis and in 14 due to large babies. Disproportion was thus claimed in 63·5 per cent of the 79 cases. However, 64·4 per cent of face presentations were spontaneous deliveries so that the degree of disproportion cannot have been of much clinical significance. The diagnosis of disproportion was made clinically and no pelvic measurements are given.

They point out that the average weight of 64 full-time children was 7 pounds 12 ounces as compared with 7 pounds 2 ounces for all full-time children in their clinic. The fact that face and brow presentations more often occur in multiparae of high parity than in primigravidae (as shown by Hellman *et al.*, 1950; Reddoch, 1948) might account for this difference in weight.

Posner and Cohn (1951), in a series of 45 cases of face presentation, gave disproportion as a cause in 16 cases, 9 due to contracted pelvis and 7 to large babies, an incidence of 35 per cent. However, there were 29 spontaneous deliveries, an incidence of 64·4 per cent. This is the same figure that Posner reported in his series with Buch (1943) although the incidence of disproportion is only 35 per cent compared with 63·5 per cent in their earlier series.

From these considerations it is clear that there is no reliable evidence in these papers that contracted pelvis is a cause of face or brow presentation.

The literature dealing with contracted pelvis and its complications shows a similar lack of evidence that this condition causes face or brow presentations.

Williams and Arthure (1949), in a series of 600 radiological pelvimetries, had 245 cases of contracted pelvis. In these there were no cases of face or brow presentation. Hawksworth and Allen (1951), in a paper on 633 radiological pelvimetries, reported 262 contracted pelves with 1 brow presentation and no face presentation (personal communication).

In a personal series of 500 radiological pelvimetries there were 215 contracted pelves without a case of face or brow presentation arising during labour.

The impression that there is disproportion is created in face and brow presentations because the head is usually free at the onset of labour. Owing to the fact that it is extended, the foetal head feels bigger than normal. If an operative vaginal delivery is necessary, it may be difficult, due to the unfavourable presentation. This gives an impression of contracted pelvis even when the pelvic measurements are normal.

Placenta Praevia

In Table II it will be seen that 4 out of 6 authors who gave detailed figures had one or more cases of placenta praevia. Posner and Buch (1943) had 5 cases, Rudolph (1947), Reddoch (1948) and Simpson (1950) had 1 case each. This gives a total of 8 cases of placenta praevia in 417 face presentations, an incidence of 1 in 52. This is much higher than the incidence of placenta praevia in pregnancy as given in standard text-books. The figures given by Greenhill (1951) are 1 in 126, by Gibberd (1947) 1 in 180 and by Kerr and Moir (1949) 1 in 200 cases.

Macafee (1945) had one case of "marked extension of the head and neck" shown by X-ray in 173 cases of placenta praevia.

These figures tend to support the idea that there is an association between face presentation and placenta praevia. The significance of this will be discussed in connexion with primary face presentation.

Occiput Posterior Positions

It is strange that, despite the variety of causes to which face and brow presentations were attributed (Table II), only 1 article, Tucker *et al.* (1950) gave occiput posterior position as a cause. They attributed 13 of 64 cases of face presentation to posterior position of the occiput and found no other cause to account for any of their other cases. Text-books, e.g. *Modern Trends in Obstetrics and Gynaecology* by Bowes (1950), generally mention posterior position of the occiput as an important cause of face and brow presentation.

In 100 private cases of occiput posterior described in detail by Beard (1950) there was no

face and 100 of brow presentation. Where the figure 0 is given it means that the author mentioned this as a factor which was not found in his series. Where the space is blank the condition has not been mentioned by that author. Note that the biggest number of cases in each series is that for which no cause could be discovered.

case in which a face or brow presentation developed during labour.

Cratty (1935), in a study of 6,223 vertex presentations, found 714 presenting with the occiput posterior. In these no case of face or brow presentation occurred.

Caldwell, Moloy and D'Esopo (1934), in a very careful study of 52 cases which were either occiput posterior or transverse presentations tending to occiput posterior, had no case which became a face or brow presentation. These occiput posterior presentations were diagnosed radiologically as early in labour as possible.

The mechanism by which an occiput posterior position becomes a face presentation, after the head has descended into the pelvic cavity, during labour, is nowhere described in detail. It is doubtful if such mechanism could occur with a normal sized infant as it involves the mento-vertical diameter of 13·5 cm. rotating in the cavity of the pelvis where the greatest diameter is 12 cm.

It has been assumed that the minor degree of extension which is present in occiput posterior presentation becomes the major degree of extension of face and brow presentation. There is no satisfactory evidence to support this assumption.

The Umbilical Cord

Coils of umbilical cord round the neck and body of the foetus are frequently given as causes of face and brow presentation.

In Table II, 17 cases of face and 2 of brow are attributed to the cord being round the neck. The number of coils is not stated. This gives an incidence of 19 in 468 cases or 4 per cent. One or more loops of cord are found round the neck in 20 per cent of all vertex presentations (Greenhill, 1951). It follows that in only one-fifth of cases of face and brow presentations in which the cord is round the neck, is it supposed to be the cause of the presentation. No explanation has ever been given as to how this one-fifth of cases is selected or how four-fifths are excluded.

Tucker *et al.* (1950) and Simpson (1950), in a total of 147 cases of face and brow presentations, attributed no case to the cord being round the neck, although the cord was probably round the neck in 29 cases, i.e. 20 per cent.

Posner and Buch (1943), in 79 cases of face and brow presentation in which accurate records were available, gave coils of cord round the neck as the aetiological factor in 7, or less than half of the expected number of cases, assuming that the cord was round the neck in 20 per cent of cases.

Posner and Cohn (1951), in a series of 45 cases of face presentation considered cord round the neck to be the cause in 9 cases. This is exactly 20 per cent which is the incidence of cord round the neck in all vertex presentations.

Earn (1951), in a series of 5,676 consecutive deliveries, found that there were 1,272 cases in which the cord was looped round the neck, an incidence of 20·6 per cent. The loops were found in the following numbers:

One coil of cord in	1,103 cases
Two coils of cord in	133 cases
Three coils of cord in	31 cases
Four coils of cord in	4 cases
Eight coils of cord in	1 case

Foetal asphyxia occurred in the 1 case with 8 loops round the neck. With this exception, looping of the cord was of no clinical significance.

Morgan (1948), in a study of cord complications occurring during pregnancy and labour in 10,000 deliveries, does not mention face or brow presentation as one of the complications.

Hydramnios

Table II shows that hydramnios occurred in 10 cases. This figure does not include the large number of cases of anencephaly in which there is usually gross hydramnios and face presentation. The mechanism by which hydramnios is supposed to cause face presentation is not clear, as the foetus remains free in the liquor until the membranes rupture. If it is accepted that contracted pelvis, tumours in the pelvis and other conditions which reduce the capacity of the pelvic brim, cause extension of the foetal head by pressure on the posterior end of the head lever, then hydramnios should prevent this extension rather than cause it.

Parity

The association of face and brow presentation with multiparity, and more frequently in women having a fifth or later pregnancy than in earlier pregnancies, is shown in all the papers dealing with the subject. Thus Posner and Buch (1943)

found that face and brow presentations occurred in multiparae in 72·1 per cent of cases as compared with 58 per cent of multiparae among all deliveries. The deviation of 14·1 per cent is statistically significant. Hellman *et al.* (1950) gave the following figures to prove that the incidence of multiparity was higher in face and brow presentations than in his clinic as a whole:

	Clinic as a whole per cent	Face Presentation per cent	Brow Presentation per cent
Primiparae	47·1	31·8	37·2
Multiparae	52·9	68·2	62·8

These figures show beyond doubt that there is a higher incidence of face and brow presentations in multiparae than in primiparae.

Conclusion

From these considerations it can be concluded that there is no acceptable evidence that contracted pelvis, disproportion, coils of umbilical cord round the neck or posterior positions of the occiput cause face or brow presentations.

The other conditions which are supposed to cause face or brow presentation are so rare, or so casually accepted as aetiological factors, that they do not merit individual consideration.

Placenta praevia and multiparity may be considered as predisposing factors to, but not as causes of, extension of the foetal head. These findings are compatible with the theory of increased extensor muscle tone as the cause of face and brow presentations, as will be shown in the next part of this essay.

Primary Deflexion Attitudes

Definition

The term primary face or brow presentation is used to indicate a case in which a normal foetus presents as a face or brow before the onset of labour. It is necessary to give this definition at this point, as some authors have used these terms in a different sense.

The aetiology of primary face and brow presentation

The normal attitude of the foetus *in utero* is one of flexion. This is due to slightly greater tone in the flexor than the extensor muscles. It can be shown by radiological examination of the foetus early in pregnancy, or when there is an excess of liquor amnii present in late pregnancy, that this attitude of flexion is not due to pressure of the surrounding uterine wall. Under these circumstances the foetus will be seen to have adopted an attitude of flexion, although it is free to take up any other attitude, except perhaps full extension of the legs and body, without restraint from the uterine walls.

It is the purpose of this essay to show that primary face and brow presentations are due to increased extensor tone in the muscles of the back and neck and that the foetus adopts this attitude without pressure from the uterus or obstruction to an attitude of flexion from the various conditions which have been considered in the earlier part of this paper. The cause of this relative increase in tone of one group of muscles is not known. It can come and go during pregnancy with consequent change in attitude of the foetus. This has frequently been reported in the literature.

This extension of the foetal head is not limited to vertex presentations. It is frequently seen in breech presentation and when the foetus is lying transversely. This is further evidence that it is an intrinsic condition of the foetus and that it is not influenced by conditions which reduce the capacity of the pelvic brim.

The incidence of deflexion attitudes

Most text-books of obstetrics describe primary face and brow presentation as a rarity of little clinical significance, as the following quotations show:

"Face presentation is only occasionally met with in pregnancy and appears to be usually produced during labour by conditions which prevent the easy entrance of the vertex into the pelvic brim." Eden and Holland's *Manual of Obstetrics* by Brews (1948).

"The diagnosis is seldom made prior to labour, partly because the conditions which produce face presentation usually operate only after the onset of labour . . ." *Textbook of Obstetrics* by Strachan (1947).

"Primary face presentation is but seldom found in the antenatal period as it usually occurs for the first time after labour sets in . . ." *Antenatal and Postnatal Care* by Browne (1951).

"Primary face presentations are extremely rare and in practice the possibility of their occurrence is disregarded. The author has seen but one instance of face presentation before the onset of labour, the diagnosis of which he was able to confirm by X-ray." *Obstetrical Practice* by Beck (1951).

"Every face presentation begins as a presentation of the brow, the extreme extension occurs only when the head is subjected to the action of the uterine pains and the resistance in the walls of the genital tract." *Obstetrics and Gynaecology* by Curtis (1933).

Hellman *et al.* (1950) refer to minor variations in position of the spine and the occiput as a possible cause of the occurrence of face presentation prior to the onset of labour. They had no case in their series of 141 face presentations and 45 brow presentations.

Light (1950) is reported as saying: "It is our feeling that face presentation is rarely primary, but occurs as a result of labour . . ."

Rudolph (1947) had 1 case which was a primary face presentation. This was discovered during a Caesarean section for placenta praevia. He includes this as a secondary face presentation due to placenta praevia. Posner and Buch (1943) had 1 case confirmed before labour by X-rays. It is thus believed by the majority of authors that primary face presentation is a rare occurrence. This is due to the fact that it has not often been diagnosed in the past owing to the difficulty of diagnosis.

Diagnosis

The discussion of diagnosis will be restricted to primary face presentation but the same principles apply to brow presentation.

The diagnosis of primary face presentation by abdominal palpation is very difficult. Text-books describe a deep groove between the occiput and the shoulders which can be easily palpated.

In 2 cases to be described later, with X-ray plates as a guide, it has not been possible to confirm the presence of this groove or the other supposed typical signs.

This difficulty in diagnosis has been stressed by several authorities. Posner and Buch (1943) state: " . . . the authors were impressed by the difficulty of diagnosis solely by abdominal palpation." They advocate the early use of radiology in suspected cases.

" . . . even the skilled accoucheur, after careful palpation, may overlook a face presentation. A radiograph is of invaluable assistance." *Combined Textbook of Obstetrics and Gynaecology* by Baird (1950).

" . . . thus the sign so often described and illustrated, of a hard occiput above and to one side of the symphysis with a sulcus above and the back palpable above that, can very rarely be elicited." *Textbook of Obstetrics* by Strachan (1947).

Posner and Buch (1943) give the following figures in support of their plea for X-ray examination early in labour:

Suspected on abdominal palpation		1
	Confirmed by X-ray	1
Suspected early in 1st stage of labour		5
	Confirmed by X-ray	5
Diagnosed early in the 1st stage		4
Total No. of cases diagnosed in 1st stage of labour		22
Total No. of cases diagnosed in 2nd stage of labour		11
Total No. of cases diagnosed during or on delivery		20

Posner and Cohn (1951) again stress this point and give the following table from their series of 45 cases:

Time and Means of Diagnosis

Means	Before onset of labour	First Stage	Second Stage	At Delivery	Presenting Part at Vulva
Suspected abdominally ..	—	3	—	—	—
Rectal	1	7	1	—	—
Vaginal	—	4	5	20	3
X-ray:					
Diagnosis	1	—	—	—	—
Confirmation ..	—	3	—	—	—
Total time of suspicion ..	2	14	6	20	3

Reddoch (1948) expressed the view that primary face presentation was not uncommon in view of the fact that there was no cause found in 56 cases out of his total of 160. He considered that all 56 cases were primary, but none were diagnosed before labour as none were examined radiologically. In discussing Reddoch's paper King (1948) stated that he had diagnosed several cases before the onset of labour. He stressed the value of radiological examination in making the diagnosis and in excluding anencephalic monsters.

This emphasis on radiological diagnosis is common to all authors who have described cases of primary face presentation. Other deflexed attitudes in vertex presentations are more easily diagnosed on abdominal palpation.

The incidence of deflexion attitudes before the onset of labour

If it is accepted that the cause of face and brow presentation is increased tone in the extensor as compared with the flexor muscles, then one would expect to find this present in presentations other than vertex presentations and in babies after delivery. Both these expectations are satisfied in the following cases taken from the literature. Gibberd (1935) was first to draw attention to this when he described 3 cases which showed muscle spasm as a cause of malpresentation. These 3 examples of hyperextension were diagnosed radiologically. They occurred in a breech presentation, a brow presentation and a transverse lie. His use of the term "spasm" was unfortunate as it may have misled other observers into not recognizing the slight increase in tone which is all that is present in most cases after delivery. Gibberd (1939) again drew attention to this condition. He replaced the term "spasm" in his previous description by the more accurate description "increased tone". He described a case of hyperextension of the foetal spine which persisted whether the foetus was presenting as a vertex or a transverse lie. After delivery by Caesarean section the foetus showed no abnormality in its muscle balance. A similar case was reported by Knowlton (1938) in which the excessive extensor tone persisted in the infant for 2 weeks after delivery. Gibberd (1939) described a further case which he had been shown by Searle in which the excessive tone was still present when the infant was 7 weeks old. These 3 cases illustrate the variation of duration of the excessive tone after delivery. Other cases show a similar variation while the foetus is *in utero*. From his study of these cases Gibberd concluded that excessive extensor tone ought to be regarded as a common cause of face and brow presentation rather than a rare academic possibility.

Hyperextension of the head in breech presentation

Wilcox (1949), in a study of the attitude of the foetus *in utero* in breech presentation, found 2 cases of extreme extension of the head diagnosed by radiological examination. He quotes the similar findings of Brakeman (1936) who found 2 cases of extreme extension of the head in 191 cases of breech presentation.

These results, if combined, give in breech presentations an incidence of 1 case in 203 showing extension to a degree equivalent to that of face presentation, when the foetus is presenting as a vertex.

These figures show that extreme hyperextension can occur, without the influence of the contractions of labour or the bony pelvis, and with an incidence twice as great as would be required to account for all cases of face presentation as primary face presentations.

Some recently published cases of hyperextension of the foetal head

Since Gibberd (1939) described the cases referred to above a number of cases of hyperextension of the foetal spine in various presentations have been published. The frequency of these reports is additional evidence that increased extensor tone is not a rare occurrence compared with face and brow presentations.

The following Table gives brief details of 7 cases reported recently in the *Journal of Obstetrics and Gynaecology of the British Empire*.

From the Table it will be seen that in every case the diagnosis of hyperextension was made unexpectedly when the patient was examined radiologically for some other indication. This explains why hyperextension of the foetal spine is more commonly diagnosed when the presentation is abnormal than in vertex presentations.

TABLE III

Author	Date of Publication	Condition	Diagnosed Clinically	Diagnosed Radiologically	Interval between Diagnosis and Delivery	Persistence of Extension after Delivery
Vartan	August, 1949	Primary face which became a brow	No	Yes	6 days	14 days
Deacon	April, 1951	Hyperextended head in a breech. Foot presenting	No	Yes	12 days elective Caesarean section	Not stated
Denny	June, 1951	Hyperextended head in transverse lie ..	No	Yes	5 days	6 weeks
Wilkin	October, 1951	Primary face presentation following external cephalic version	No	Yes, while presentation was a flexed breech	6 weeks	3-4 days
Hall (2 cases)	April, 1952	Hyperextended head in a breech. Foot presenting	No	Yes	11 days labour induced	3 days
		Hyperextended head in a breech. Foot presenting	No	Yes	1 day labour induced	36 hours
Cummin	June, 1952	Twin brow presentation	No	Yes in one twin	8 days	Not stated

PRIMARY FACE PRESENTATIONS

The first accurately recorded case of primary face presentation due to increased extensor tone was described in 1879 by Croom in a paper entitled "The Causation of some Primitive Face Cases".

In this remarkable paper he reviewed the literature on the subject of primary face presentation and criticized the views of Daventer, Baudelocque and Duncan, who " . . . refer the cause to some fault in the powers of parturition, namely, uterine obliquity". He pointed out that, in 85 recorded cases, 49 had been announced as primary face presentation before the rupture of the membranes. In these 85 cases there were only 3 in which the uterus was in a state of well marked obliquity and only 1 where the amniotic fluid was in excess. He criticized Matthews Duncan who read a paper in Edinburgh in April, 1870, on the production of presentations of the face. After quoting his reference to the occurrence of primary face presentations, Croom states: "To this extraordinary kind of face presentation, and others allied to it, Dr. Duncan makes no reference whatever, confining himself entirely to the mechanism of the production of face presentation under ordinary circumstances."

This criticism might still be levelled against the majority of obstetricians who write about face presentation. As shown in the quotations given earlier, some do not even admit the possibility of primary face presentation.

Croom then described in detail a case of primary face presentation which showed the following important features:

(1) The diagnosis was made clinically by inserting the forefinger through the cervix with the membranes intact.

(2) The patient was a gravida-3.

(3) The head was free.

(4) The degree of extension changed from time to time before the onset of labour as shown here:

Date	*Presentation*
26th Sept., 1879	Right occiput posterior
27th ,,	Full face. Left mentolateral
28th ,,	Full face
13th Oct.	Full face
14th ,,	Right occiput posterior
14th ,, (evening)	Full face
15th ,,	Full face
16th ,,	Full face
16th ,, (10 p.m.)	Full face
17th ,,	Labour began—face presentation

The position was altered to right occiput posterior which rotated to the front and a normal delivery took place.

(5) After delivery the child kept its head in the extended attitude and this was still present 1 month after delivery.

He made three very important comments on this case:

(1) None of the usual causes of face presentation could apply when the foetus was floating freely in liquor.

(2) The first few contractions of labour changed the presentation from a face to an occiput posterior and not vice versa.

(3) The explanation of this case lay in the fact that the muscles of the back of the neck were strongly contracted so that the occiput was drawn backward and the chin was well extended from the chest.

Following this description of a single case, diagnosed without the help of radiology, but showing all the important points in a case of primary face presentation, text-books and other authors continued to ignore the condition, as had Matthews Duncan in 1870, until in 1939 Gibberd, quoted previously, expressed the belief that it was not an uncommon condition.

The incidence of primary face presentation

If it is accepted that, with rare exceptions, primary face presentations can only be diagnosed radiologically, then it is in large series of radiological examinations that evidence as to the true incidence of primary face presentations can be found. Table IV gives some information on the subject.

From this it is seen that in suitable series the incidence of primary face presentation is as high as or higher than the accepted incidence of face presentation of 1 in 500.

It is only in a series of suitable cases that primary face presentations will be found. Unsuitable cases are those where the vertex cannot be easily palpated above the brim. A series of radiological examinations of patients in whom the foetus is either presenting as a breech, or the vertex is deeply engaged in the pelvis, will be most unlikely to show a primary face presentation, as one of the characteristics of primary face presentation and other deflexed attitudes of the vertex is the ease with which the free head can be palpated. In all reported cases the head has been easily palpated above the brim until the onset of labour. As the incidence of face presentation is higher in multiparae than in primiparae, there is a much better chance of detecting primary face presentations if radiological examinations of multiparae are not excluded.

The circumstances under which a large number of primiparae and multiparae at term with a free head would require radiological examination are not very numerous. It is this lack of indication for radiological examination in suitable cases which has resulted in so few cases of primary face presentations being diagnosed.

In the publications on various subjects describing the results of antenatal radiological examinations of large numbers of pregnant women at or near term, there has not been a single report of a case of vertex presentation at the onset of labour which became a face presentation. This complete lack of radiological evi-

TABLE IV

Name of Author	Indication for Radiography	Number of Cases	Number of Primary Face Presentations	Incidence
Dippel and Brown (1940)	Visualization of placenta	262	2	1 in 131
Kenny (1944)	Radiological pelvimetry	1,000	2	1 in 500
Author's cases (unpublished)	Radiological pelvimetry	500	3	1 in 133
Macafee (1945)	Free head at full term	Not stated	1	
Bishop (1945)	Visualization of placenta	,, ,,	1 (Fig. 519)	
Rowarth (1940)	Radiological pelvimetry	,, ,,	1	
Posner and Buch (1943)	Not given	,, ,,	1	

Table to show a number of primary face presentations discovered by radiological examination near full term. None were diagnosed clinically. Where the number of cases examined is known a high incidence is shown.

dence that a face presentation has ever arisen during labour should be enough to disprove the secondary origin of face presentation.

Record of 3 cases of primary face presentation

These 3 cases of primary face presentation were discovered accidentally among 500 patients referred for radiological pelvimetry when near term. The patients were selected for examination when it appeared that the head would not engage in the brim. In this way the series is comparable to Kenny's (1944) but differs from that of Williams and Arthure (1949) in which the patients were referred for radiological pelvimetry early in pregnancy owing to a clinical diagnosis of contracted pelvis.

The author's 3 cases were detected in 500 radiological pelvimetry examinations carried out in 1950 and 1951 and in the first quarter of 1952. These 500 cases were selected from approximately 2,400 patients, most of whom had been booked for confinement in hospital. In these 2,400 cases there were 5 deliveries as face presentation, an incidence of 1 in 480 cases. Two of these 5 cases had not been examined radiologically during pregnancy. In 3 out of 5 cases the radiological examination gives positive proof that they were primary face presentations. There is no evidence that the other 2 cases were not primary face presentations.

CASE 1

A primigravida, aged 34 years, attended the antenatal clinic in February, 1950. Her last menstrual period was on 9th October, 1949: the expected date of confinement was 16th July, 1950. Her height was 4 feet 11 inches and there was no significant family or medical history. She complained of a "sharp" pain in the lower abdomen. This was not influenced by position or movements, neither was it accompanied by nausea or vomiting. She had some frequency of micturition. A catheter specimen of urine was sent for laboratory examination. The report showed a normal urine.

On the 26th March it was noted that the uterus was bigger than expected. A radiological pelvimetry examination produced the following report:

The pelvic measurements were as follows:
Brim—true conjugate 10·9 cm.
Available transverse of the brim 10·9 cm.
Cavity—lower antero-posterior 11 cm.
Interischial spinous 9 cm.
Outlet—posterior sagittal 7·2 cm.
Sub-pubic angle 78°.
An oval type of pelvis. The transverse measurements of both the brim and cavity were reduced. The outlet is contracted.

The foetus is of 38-weeks maturity. The bi-parietal diameter of the foetal skull is 9 cm. The foetal head is markedly extended giving a primary face presentation.

Allowing for further growth of the foetal skull some degree of disproportion may be expected at full term.

On the 12th July the patient was uncomfortable due to excessive tightness of the abdominal wall. There had been a marked increase in the hydramnios since the last visit.

On the 19th July the head had settled into the brim and there was no overlap. There was still considerable discomfort due to hydramnios.

It was not possible to confirm the classical signs supposed to be present on abdominal palpation in a case of face presentation.

On the 24th July the patient was admitted in false labour. The membranes were intact. The blood pressure began to rise. On the 28th July it was 160/100 mm. having been 130/70 mm. on admission to hospital. It was decided to do a surgical induction of labour by rupture of the hindwaters.

On the 29th July under general anaesthesia the cervix was found to be taken up and slightly dilated. A bulging bag of membranes ruptured during examination and a considerable quantity of liquor escaped. The face presentation was confirmed, the position being left mento-lateral. Labour did not begin until 7 a.m. on 31st July. Pethedine and hyoscine were given and labour progressed satisfactorily. The first stage lasted 17 hours 30 minutes. After 2 hours in the second stage the chin had reached the pelvic floor and the position was L.M.A. A low forceps delivery of a female child weighing 6 pounds 2 ounces was easily carried out.

The baby's head was markedly extended and as this extension had not disappeared by the 7th day an X-ray of the head and spine was carried out (Fig. 1). This showed no bony abnormality. It shows the marked degree of extension which still remained on the 7th day after delivery. Some extension was still present 4 weeks after birth.

Comment

This case illustrates several of the points to be expected in a face presentation:

(1) A free head at term.
(2) Some hydramnios with a normal foetus.
(3) Persistent extension of the head for 4 weeks after delivery.
(4) Duration of the increased tone from the date of radiological examination until delivery was 28 days.

CASE 2

Mrs. C.B. was aged 23 years and was a gravida-2. She attended the antenatal clinic on the 22nd May, 1950. She was then 16-weeks pregnant. The expected date of confinement was 29th October, 1950. The size of the uterus

corresponded with the period of amenorrhoea. The patient continued to attend the antenatal clinic at regular intervals. Her urine was normal and her blood pressure never exceeded 110/76 mm. mercury. The foetus was rather unstable and the presenting part remained high. At the 35th week the presenting part was a vertex. The following week it was a breech and an easy external cephalic version was carried out. At the 38th week the vertex was presenting and a clinical diagnosis of extended foetal head was recorded. At the 39th week the note read:

"Eccentric presenting part, free head."

On vaginal examination no gross contraction of the pelvis was detected. The patient was sent for a radiological pelvimetry examination. This was carried out on 29th October and showed that the pelvis was platypelloid with a prominent sacral promontory. The measurements were:

Brim—true conjugate 9·7 cm.

Available transverse 12·4 cm.

Cavity—Lower antero-posterior 11·4 cm. Interischial spinous 11·3 cm.

Outlet—posterior sagittal 7·3 cm.

Sub-pubic angle 87°.

Biparietal foetal skull 8·4 cm.

Maturity of foetus 39 weeks.

COMMENT

The foetal head is markedly extended—face presentation—definite moulding of the skull bones is taking place. Some difficulty is likely to be experienced but not absolute disproportion.

Two days later the head was still free with the face presenting as a left mento-anterior (Fig. 2). There was a slight degree of hydramnios.

On the 5th November—7 days after the expected date—the patient went into labour. The first stage of labour lasted 14 hours and the second stage half an hour, ending by the spontaneous delivery as a mento-anterior of a living female infant weighing 7 pounds 14 ounces. The biparietal diameter was 8·5 cm. Extension of the head was present for 5 days after delivery but was not noticeable after 12 days.

Comment

The points to be noted are:

(1) An unstable foetus.

(2) A very easy external cephalic version at the 36th week of pregnancy.

(3) A free head at term.

(4) Some degree of hydramnios.

(5) Persistence of the hyperextension of the head for 5 days after delivery.

(6) The interval between radiological examination showing increased extensor tone and delivery—8 days.

CASE 3

Mrs. M.R. was aged 32. She was a primigravida and the expected date of confinement was 8th September, 1950. The patient attended the antenatal clinic for the first time on 23rd August, 1950. She was then 38 weeks pregnant and the presentation was a breech. A very easy external cephalic version was performed. The obstetrician noted: "I think it (i.e. breech presentation) might recur." When seen 2 days later the vertex was presenting but free.

On 6th September the head was free and a slightly contracted pelvis was diagnosed clinically. The patient was sent for a radiological pelvimetry examination. This was carried out on the 9th September and the report was as follows:

Brim—true conjugate 10·3 cm.

Available transverse 11·8 cm.

Cavity—lower antero-posterior 10·8 cm. Interspinous 9·6 cm.

Outlet—posterior sagittal 8 cm.

Subpubic angle—85°.

Foetal measurement: biparietal of foetal skull—9·1 cm.

Maturity—40 weeks.

Marked extension of the baby's head but no abnormality of the cervical spine shown (Fig. 3).

COMMENT

No disproportion if the foetal head were presenting in a normal manner.

On 13th September there were signs of toxaemia of pregnancy and the patient was admitted to hospital for rest.

14th September: the note read "Vertex, head free, some hydramnios."

21st September: labour commenced with vague pains.

22nd September: after good contractions for about 24 hours and a second stage of 3 hours, a forceps delivery was carried out.

The membranes had remained intact and the face had not descended beyond mid-cavity. Owing to an unfortunate mischance the X-ray plates had not been seen at this time and the radiologist's report of "marked extension of the foetal head" was interpreted by the operator as implying that the presentation was an occiput posterior. A very difficult forceps delivery resulted in delivery as an occiput posterior of a stillborn infant. Post-mortem examination showed the cause of death to be a cerebral haemorrhage. From the moulding and oedema of the baby's face it was clear that this had been a face presentation which had been converted from a mento-posterior, more by accident than design, to an occiput posterior.

The points to be noted in this case are:

(1) A very easy external cephalic version at 38 weeks of pregnancy in a primigravida.

(2) A free head at term.

(3) Some degree of hydramnios.

(4) Interval between radiological diagnosis and delivery—12 days.

From a study of these 3 cases of which detailed antenatal notes are available, together with the other cases of primary face presentation

which have been described earlier, it is possible to make some deductions which help in the diagnosis of primary face presentation.

The first point to be considered is the difficulty in diagnosing a presentation which may change to a different presentation and back again in a few hours time.

The variable duration of increased tone in the extensor muscles

Delivery of a foetus as a face presentation can be accepted as evidence that increased extensor tone was present at the onset of labour. Delivery of a foetus as a vertex presentation does not necessarily mean that it has never been a primary face presentation. If a primary face presentation is known to be present at some time before labour begins, the extensor tone may decrease or pass off so that the presentation becomes a brow, bregmatic or flexed vertex presentation.

This change of presentation has been reported on several occasions as in the case already described which was reported by Croom. In 15 examinations carried out between 26th September and the onset of labour on 17th October, a face presentation was found 11 times and an occiput posterior 4 times. During labour the presentation was an occiput posterior which underwent forward rotation. Other cases have been examined radiologically and consequently a smaller number of observations were made in each case. The smaller number of observations is counterbalanced by the greater accuracy with which the degree of change of attitude can be assessed. Rowarth (1940) reported the following interesting case: a primipara, aged 33 years, was seen on 11th May. The head was high, mobile and felt abnormally large. Radiological examination showed the head nearly fully extended with the back on the right. On the 15th May a radiograph showed a flexed vertex with the back on the right. On 22nd May, X-ray examination showed a face presentation with the back on the left. Two days later, following a trial of labour, the infant was delivered by Caesarean section. The face was presenting. No cause was found in the pelvis, uterus or foetus. He concludes: "It is only possible to say that this malpresentation may have been due to spasm of the muscles of the back."

Posner and Buch (1943), in their report on 87 face presentations and 13 brow presentations, state that they did not find a case due to "spastic contraction or congenital shortening of the neck muscles". They then add this description of a case which they saw after completion of their series. An X-ray showed an unengaged face presentation when the patient was not in labour —16 hours later another radiological examination before the onset of labour showed a vertex presentation.

These cases prove beyond doubt that while *in utero* the attitude of the foetus can change from one of flexion to one of extension, and vice versa, in a few hours. It is clear that an apparent error in diagnosis may be due to a change of attitude of the foetus, between the time of diagnosis and the time of delivery. This change of attitude cannot be the cause of failure to diagnose primary face presentation in most cases as it has been shown in Table III that hypertonus of the extensor muscles is sometimes present for several weeks before and after delivery.

Diagnosis of face presentation by abdominal palpation

It is only in rare cases that a confident diagnosis of face presentation can be made without radiological examination or, in suitable cases, vaginal examination. There are certain signs which should lead to a consideration of a diagnosis of primary face presentation. From a careful examination of the records of the cases which have been discussed in this paper, the suggestive findings are as follows:

(1) A free head at term which does not lie symmetrically over the brim.

(2) An unstable lie.

(3) An easy external cephalic version late in pregnancy. If a radiograph is available it will often show some deflexion of the foetal spine with one or both legs flexed. This extended attitude of the foetal spine in breech presentation has been commented on by Vartan (1949), Wilcox (1949) and Brakeman (1936).

(4) The head feels larger than normal or may appear to be eccentrically placed with regard to the body of the foetus.

(5) A slight degree of hydramnios is almost invariably present.

Having suspected a face presentation, due to the detection of some of these signs, the matter can be decided by either a careful vaginal examination, if the cervix is sufficiently open to admit a finger, or much more readily by a radiological examination.

Hydramnios and face presentation

A slight excess of liquor was present in all 3 of the author's cases of primary face presentation. "Hydramnios" was noted on one or more occasions at the antenatal clinic during the weeks immediately preceding diagnosis. In none of these cases was the excess of liquor amnii of such a degree as to indicate the advisability of an X-ray examination of the foetus. This was the criterion for hydramnios laid down by Macafee (1950) in his paper on hydramnios. In Case I the hydramnios was sufficient to cause some discomfort at term.

Hydramnios may be due to various causes. One of the commonest is inability of the foetus to swallow. This is the cause of the hydramnios associated with anencephalic monsters especially when the choroid plexuses are not exposed, and in other cases where there is congenital atresia of the oesophagus. Where there is only a partial atresia of the oesophagus or, as is more usual, where there is a fistula between the trachea and the lower oesophageal pouch, the degree of hydramnios is less than in complete obstruction. A similar small excess of liquor is found in association with duodenal atresia in the foetus, as pointed out by Bodian, White, Carter and Louw (1952) and also by Mengert and Bourland (1945).

When the foetal head is fully extended so that the occiput is pressing on the back, the oesophagus would be partially occluded due to stretching of the pharynx and pressure on the oesophagus by the larynx and trachea in front and the cervical vertebrae behind. A severe degree of hydramnios does not develop due to the fact that the extensor tone may become less at times, especially during foetal movements. The rise in pressure of the amniotic fluid may be sufficient to partly overcome the obstruction, so that a state of equilibrium is reached.

If these arguments are correct, it is apparent that the hydramnios is due to the hyperextended attitude of the head, and not the reverse, as has sometimes been supposed.

Placenta praevia

It has been shown previously that there seems to be some association between placenta praevia and face presentation. The figures given are not conclusive but no further figures are available. When the results of large numbers of cases of ante-partum haemorrhage treated expectantly are available, it will be apparent whether there is a higher incidence of face presentation in association with placenta praevia or not. If there is an association between these two conditions, there is a relatively simple explanation which will be discussed fully in connexion with parity, to which it also applies.

Parity

Before discussing the reason for the increased incidence of face presentations in association with multiparity, it is proposed to consider the strength of the extensor pull which is necessary to cause a face presentation. Various degrees of extension of the foetal head persist for a variable time after delivery, as shown in Table III. In some cases the infant appears normal at birth. This means that if the baby is held upright the head is not drawn back. If it is held in a horizontal position facing the floor, its head drops forward in a flexed attitude. This has been interpreted as evidence that the extensor tone which caused the deflexed attitude *in utero* has passed off. This is a fallacy, based on the assumption that the same muscular power is needed to move the head in air as in liquor. While the foetus is in the liquor amnii, a wide range of movement takes place at its various joints. The vigorous movements of the limbs which take place *in utero* do not continue after birth. This change is due to the fact that, while the foetus is in the liquor, its muscles have not to overcome the force of gravity to move a part, while after delivery the force of gravity, acting on the head and limbs, is too great to be overcome by the muscles. No surprise is occasioned when the muscle tone of a baby which presented as a normal flexed vertex is insufficient, after delivery, to prevent the head moving under the influence of gravity. It should therefore be regarded as the

exception rather than the rule to find sufficient tone in the muscles after delivery as a face presentation, to maintain extension of the foetal head against the force of gravity.

With these considerations in mind it is easy to correlate the increased incidence of face presentation with multiparity and placenta praevia. In primiparae, after the head becomes engaged at the 36th to 38th week, it is not possible for the presentation to become a face, even if increased tone in the muscles of the back and neck does develop. If there is a moderate increase in extensor tone of the muscles of the back and neck of a foetus in a primipara at the 39th-40th week of pregnancy, and the head is in the lower segment of the uterus with high tone, reinforced by tight abdominal muscles, a face presentation may be prevented from developing by the restraining effect of the surrounding structures, even when the head is not in the pelvic cavity. When the head is quite free, in a lax uterus, with lax abdominal walls, any change in extensor tone can exercise its full effect on the position of the head. When the placenta is praevia it prevents engagement of the head, and as placenta praevia is often associated with some degree of hydramnios these circumstances favour a full range of movements of the head, even in a primigravid patient.

Summary

The recent literature on face and brow presentation has been reviewed. Twenty-four alleged causes of secondary face presentation have been listed. The diversity of opinion as to the importance of each of these factors has been demonstrated. Despite the wide choice of aetiological factors available, all the authors placed the largest number of their cases into the group for which no cause could be found. No evidence could be found that contracted pelvis, disproportion, or coils of umbilical cord round the neck caused face or brow presentation.

Multiparity predisposes to face and brow presentation. Placenta praevia may be a predisposing factor.

The incidence of deflexion attitudes, due to increased extensor tone of the muscles of the back and neck, is shown to be greater than the incidence of face and brow presentations.

The increasing number of cases of primary face presentation reported recently (Table III) is due to an increasing use of radiology in obstetrics.

Figures from a large series of radiological examinations (Table IV) support the author's opinion that, if all foetuses were examined radiologically at the onset of labour, all face and brow presentations would be found to be primary face or brow presentations. In 5 cases of face presentation in 2,400 deliveries, 3 were shown to be primary by radiological examination before the onset of labour. The remaining 2 patients were not examined radiologically. There is no reason to believe that they were not primary face presentations.

In the majority of cases the diagnosis of primary face presentation can only be made radiologically. The text-book descriptions of the findings on abdominal palpation are misleading. Some signs are described which should lead to a suspicion of face or brow presentation.

The relationship between hydramnios, placenta praevia, parity and face presentation has been discussed.

Conclusions

Secondary face and brow presentations are very rare, if they occur at all.

The various conditions which are given in text-books as the causes of secondary face and brow presentation do not cause these presentations.

Hyperextension of the foetal head, due to increased tone in the extensor muscles, is a relatively common condition, irrespective of the presentation.

Most, if not all, face and brow presentations are primary, due to increased tone in the extensor muscles of the back and neck. Suspected cases can be confirmed by radiological examination.

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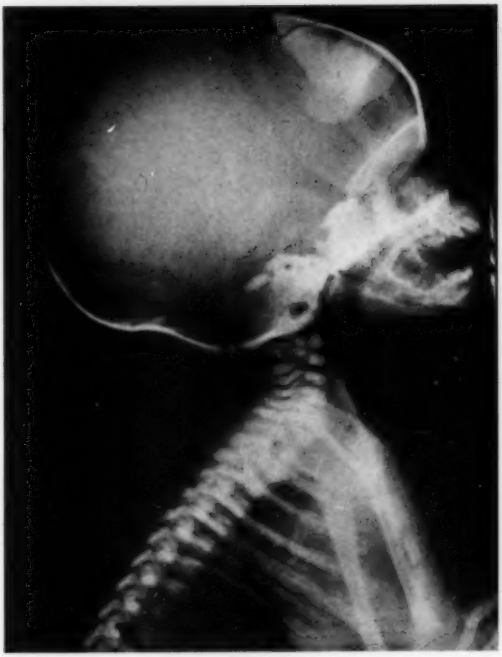

FIG. 1

The baby in Case 1. Note the extended attitude of the head. X-ray taken on 7th day after delivery to exclude abnormality of the cervical spine as a cause for the extended attitude of the head.

T.G.W.

FIG. 2

Primary face presentation shown radiologically 8 days before delivery. Case 2.

FIG. 3

Primary face presentation shown radiologically 12 days before delivery. Case 3.

graphs, and for his co-operation which made the investigation possible.

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A CLINICAL CLASSIFICATION OF DIFFICULT LABOUR AND SOME EXAMPLES OF ITS USE

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I. INTRODUCTION

DIFFICULTY in labour may be due to many different causes, particularly deformity or contraction of the pelvis, malpresentations, deformity or undue size of the foetus, and abnormalities of uterine action. Some can be defined accurately, but others, notably disturbances of uterine function, cannot be classified neatly because our knowledge of the normal physiology of labour is incomplete. There are believed to be differences in the occurrence of difficult labour between women of different races, different communities and different individual characteristics. Precise information about these differences, if they exist, would be of practical value and might also suggest possible reasons for the abnormalities. But such information is lacking, mainly because it is difficult to make a clear distinction between the normal and the abnormal in such a complex and variable process as labour, and also because it is often hard to classify abnormal labours accurately by type or by cause.

Some workers base the definition of abnormal labour on its duration, a labour being classed as difficult if it exceeds some arbitrary time limit such as 36 or 48 hours. This is unsatisfactory for several reasons. The time of onset of labour is often difficult to determine. Many truly difficult labours are over within 24 hours, while some labours which last for days ultimately end in normal spontaneous delivery without danger or particular distress to mother or child.

Caesarean section and forceps delivery rates are commonly used. They provide a more accurate indication of the occurrence of at least the more serious difficult labours. But the accepted indications for interference differ rather widely from one hospital to another. Furthermore these procedures may be carried out for reasons other than abnormality of the labour itself, such as foetal or maternal complications. The true incidence of difficult labour cannot be deduced from operative delivery rates unless these are supplemented by details of the indications for intervention in each case.

A study of the possible influence of environmental circumstances upon reproductive efficiency, including the course of labour, has been in progress at Aberdeen for some years. It has been necessary to develop a classification of labour by means of which the type and degree of difficulty can be indicated as accurately as possible. The purpose of this paper is to describe this classification and to illustrate its usefulness when applied to the study of the effects of various factors on the incidence and type of difficult labour. Each case is classified after the full clinical details have been reviewed, including the findings at each examination during labour, the mode of delivery, and the reasons for any operative intervention. With such details carefully recorded at once in each case, it has been possible to maintain uniformity and accuracy over a number of years.

II. THE CLASSIFICATION OF LABOUR

Before considering this in detail it may be well to outline the considerations upon which it is based.

There are two basic or "*intrinsic*" *factors* which may cause difficulty in labour.

(1) *Cephalo-pelvic relationships:* the size of the foetal head in relation to that of the maternal pelvis; this is largely a matter of mechanics.

(2) *Uterine and Soft Tissue Function:* the efficiency of the expulsive forces and the ability of the pelvic soft tissues to relax and distend; this is a matter of function.

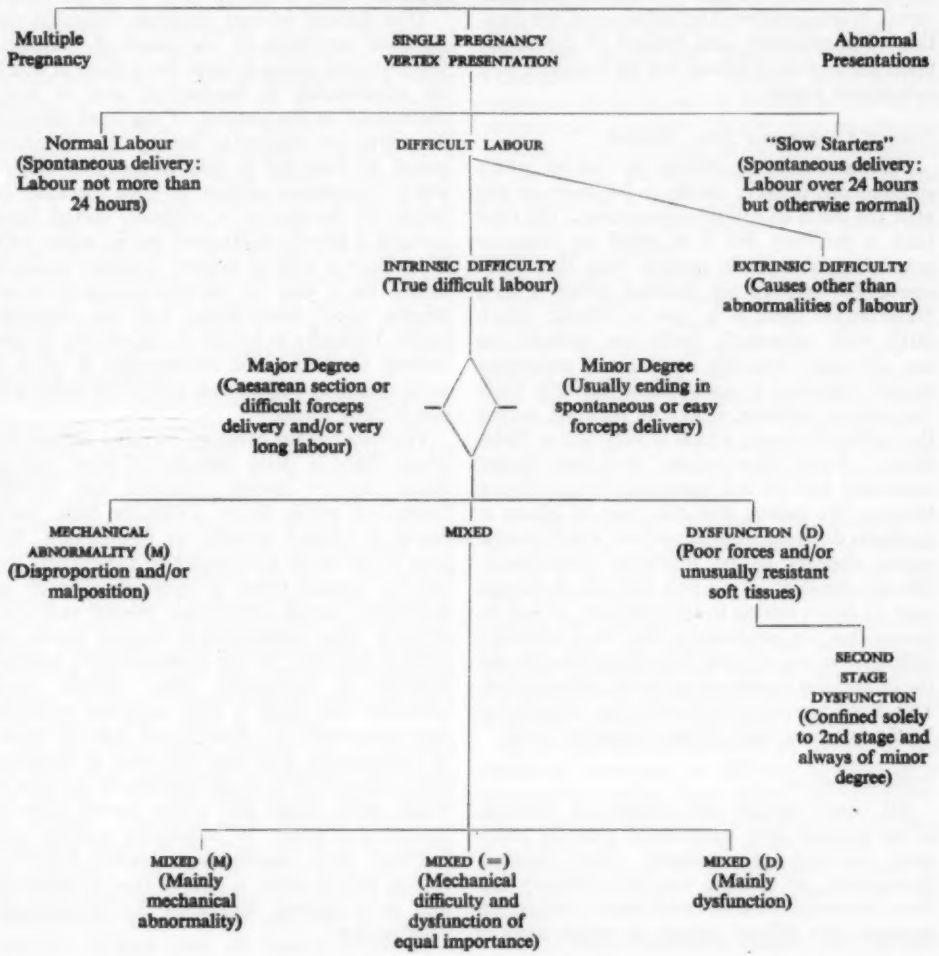
Under the heading of "*extrinsic*" *factors* may be placed such complications as, e.g., unexplained foetal distress and placenta praevia necessitating intervention when labour would in all likelihood have terminated in normal spontaneous delivery.

The suggested classification, which amplifies these considerations, is shown diagrammatically in Table I.

Multiple pregnancy involves many special

TABLE I

Classification of Labour


Multiple Pregnancy
SINGLE PREGNANCY VERTEX PRESENTATION
Abnormal Presentations
Normal Labour (Spontaneous delivery: Labour not more than 24 hours)
DIFFICULT LABOUR
"Slow Starters" (Spontaneous delivery: Labour over 24 hours but otherwise normal)
INTRINSIC DIFFICULTY (True difficult labour)
EXTRINSIC DIFFICULTY (Causes other than abnormalities of labour)
Major Degree (Caesarean section or difficult forceps delivery and/or very long labour)
Minor Degree (Usually ending in spontaneous or easy forceps delivery)
MECHANICAL ABNORMALITY (M) (Disproportion and/or malposition)
MIXED
DYSFUNCTION (D) (Poor forces and/or unusually resistant soft tissues)
SECOND STAGE DYSFUNCTION (Confined solely to 2nd stage and always of minor degree)
MIXED (M) (Mainly mechanical abnormality)
MIXED (=) (Mechanical difficulty and dysfunction of equal importance)
MIXED (D) (Mainly dysfunction)

problems in labour and therefore all multiple labours have been grouped together irrespective of whether they are normal or complicated. All *abnormal presentations*, such as transverse lie, breech, brow and face, are also grouped together regardless of the difficulty in labour they have caused. More detailed analysis of these comparatively uncommon abnormalities of labour must be postponed until a large enough series of cases has accumulated.

The main classification, then, is based upon labours in which a *single foetus presents by the vertex in any position*. The influence of the position of engagement and descent of the vertex upon the course of labour will be discussed in a subsequent paper.

Normal Labour and Slow Starters

Normal labour is defined as one in which spontaneous delivery occurs in 24 hours or less after the onset of painful contractions. The time limit is arbitrary but it is based on common practice, and it is in general true that most uneventful labours are finished within a day. Nevertheless there is a type of labour, which starts with apparently ineffective contractions but ultimately becomes normal and progresses rapidly thereafter to spontaneous delivery. Only the mildest sedation, if any, is required during the ineffective stage, which is very like a "false labour". These "slow starters" have been classed separately and are not regarded as true difficult labours. We believe that this type of labour is distinctly different from labours in which uterine action appears to be inefficient throughout. Almost one-third of all first labours prolonged over 24 hours belong to this category. It will be shown that the incidence of the "slow starters" differs from that of other prolonged labours and the underlying causes are probably different too. This distinction is lost if labours are classified as "difficult" on a basis of their duration alone.

Difficult Labour

All other labours are classed as difficult, either because they have lasted over 24 hours with evidence of unusually slow progress throughout, or because operative delivery has been necessary. Here we must make a distinction between *true difficult labours* in which there is some inherent abnormality of mechanics or function, and those in which for other reasons operative delivery has been indicated because of actual or possible risk to the mother or foetus. In this "extrinsic" category we place labours in which Caesarean section or forceps delivery has been done for reasons such as maternal disease, placenta praevia, prolapsed cord or evidence of severe foetal distress; or, in general, labours in which the main indication for interference has been concern over mother or foetus with no apparent delay or difficulty in the labour itself.

True difficult labours (intrinsic difficulty) are classified according to the cause of difficulty. The first main group is made up of those in which the abnormality is *mechanical*, due to bony obstruction in the descent of the head through the pelvis. An example of the type of case which would be included in this category is one in which Caesarean section is done because of failure of descent of a normally flexed head through a grossly contracted pelvis, either with or without a trial of labour. Another example would be a case of occipito-posterior arrest despite good contractions and an adequate pelvis. Difficulty in labour is not classed as due entirely to mechanical abnormality if there is good reason to believe that any of the delay was due to poor forces.

The other main category includes labours in which there is delay because of poor uterine action and/or unduly resistant soft tissues (cervix or pelvic floor). Difficulty from these causes is classed broadly as dysfunction. We have so far made no attempt to sub-classify the various clinical types of dysfunction such as hypotonic inertia, hypertonic inertia and constriction ring, asymmetrical uterine action or cervical dystocia. In our experience it is seldom possible to distinguish these special types clinically and there is little objective evidence that these really are distinct and different kinds of dysfunction. The only sub-class of dysfunction which we have so far specified is the type in which delay occurs only in the second stage of labour, due either to weakening uterine contractions or to inadequate voluntary expulsive forces. This is never a serious type of difficulty and it is classed separately as *Second-stage Dysfunction*.

Very often delay in labour appears to be due to a combination of mechanical abnormality and dysfunction. Such difficulties are classed as *Mixed*. This is a large group, and it has been further sub-divided according to the factor thought to be mainly responsible for difficulty. In the Mixed (M) group the difficulty has been mainly mechanical—as an example, a labour in which difficulty results from definite cephalo-pelvic disproportion but in which, also, the contractions are moderately weak and dilatation of the cervix is slow. In the Mixed (D) group dysfunction predominates, as for example, a labour which is prolonged because of definite inertia but which is also complicated by a minor degree of disproportion or by an occipito-posterior position. It is difficult to be sure whether the occipito-posterior position is a cause of dysfunction or is merely coincidental with it, and a further study of this question is in progress. Until this is clarified, all labours in which dysfunction occurs and in which the position is found to be occipito-posterior at any stage of labour are classed as Mixed, usually Mixed (D). The Mixed (=) group includes labours in which both factors appear to be about equally important.

The series of cases studied so far, and reported upon later in this paper, is comparatively small. When the difficult labours are sub-divided in this detailed way the numbers are as yet too small to be of value when analyzed. We have therefore included the Mixed (M) and Mixed (=) abnormalities with the mechanical abnormalities and considered them together as the "Mechanical group"—that is, labours in which there has been a very definite mechanical factor causing difficulty. The Mixed (D) labours have been grouped with the true Dysfunction into a "Dysfunction group" of labours in which dysfunction has been the main or only cause of difficulty.

By this classification, labours can be assigned to fairly clear categories according to the cause of difficulty, but this difficulty can differ greatly in degree. Therefore each difficult labour is classed as *major* or *minor* according to the degree of difficulty. The "major" difficulties are those in which Caesarean section or difficult forceps delivery are required, and also very prolonged labours (usually over 48 hours) which have resulted in so much maternal distress and fatigue that repeated heavy sedation or intravenous fluid therapy has been necessary. The "minor" group includes difficult labours which end in spontaneous delivery or require at most a low or easy mid forceps operation, and all cases of second stage dysfunction.

III. The Selection Factor in Studies of the Incidence of Difficult Labour in a Population

In a poor working class community the two most common causes of difficult labour are contracted pelvis and excessive childbearing. Contracted pelvis by causing disproportion increases the incidence of difficult labour in all pregnancies. Excessive childbearing predisposes to malposition, prolapse of the cord and rupture of the uterus. On the other hand most of the primigravidae in such a community are under 25 years of age, consequently the forces are usually very efficient.

In the upper economic group there is little contracted pelvis because of the absence of malnutrition and there are no really large families. But many primigravidae are over 30 years of age and as a result the forces are often poor and irregular and prolonged labour of the dysfunction type is common. In addition since families are small a high proportion of the total births are first births, thus increasing the overall incidence of difficult labour.

It might happen, therefore, that although in two hospitals the overall incidence of difficult labour is identical great differences in the type of difficulty might be found in each group. The smaller the proportion of hospital confinements in any area the greater is the selection for hospital confinement so that in extreme cases the hospital will admit only those likely to have abnormal labours, or emergency cases.

In comparing the incidence of disease or the results of treatment in different hospitals it is essential to take all these points into consideration. To avoid bias the most satisfactory method is to study the total births in an area or city. If this is impossible some indication should be given of how much selection there is in the sample.

In the present statistical analysis only married

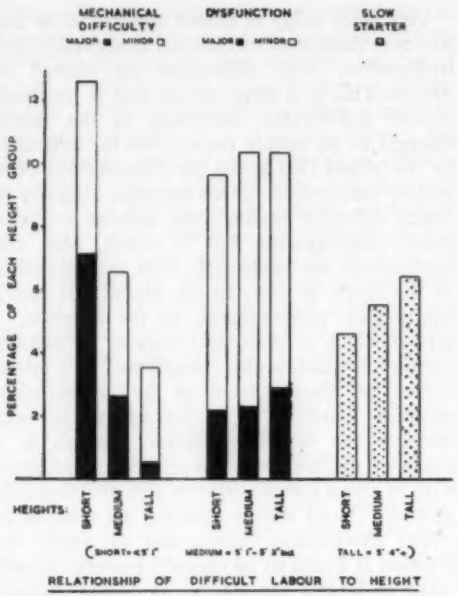
primigravidae living in the city of Aberdeen and booked for confinement in the Maternity Hospital have been studied. Only 5 per cent of all Aberdeen primigravidae are confined at home; 10 per cent, mostly in the upper economic groups, are confined in a private nursing home; the remaining 85 per cent are confined in the Maternity Hospital—they represent practically all the married primigravidae in the Registrar General's Social Classes III, IV and V and include about 10 per cent of those in Social Classes I and II. Unmarried mothers have been excluded because many of them come from other parts of the country. Similarly booked primigravidae living outside the city boundary are also excluded since their confinements in hospital have often been arranged because of anticipated difficult labour.

Most of the analyses which follow are based on the 3,504 booked, married city primigravidae delivered in hospital during the years 1948 to 1951 inclusive.

IV. Factors which Influence the Course and Outcome of Labour

(1) *Height*

The occurrence of difficult labour in short, medium-sized and tall women is shown in Table II and also, in part, in Graph A.



Graph A

Normal labour occurs in nearly 71 per cent of tall women and in 64 per cent of short women. The main difference between the two groups is

Table II

Labour in 3,504 Primigravidae Grouped by Height

Class of Labour	Height							
	Short (under 5 feet 1 inch)		Medium (5 feet 1 inch to 5 feet 3 inches)		Tall (5 feet 4 inches and over)		Height Unknown	All Cases
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	No.	Per Cent
Normal Labour	538	*64·0*	1,183	*68·7*	638	*70·8*	35	2,394	*68·3*
"Slow Starters"	39	*4·6*	95	*5·5*	58	*6·4*	2	194	*5·5*
Major Mechanical Group	60	*7·1*	44	*2·6*	5	*0·5*	—	109	*3·1*
Minor Mechanical Group	45	*5·4*	67	*3·9*	27	*3·0*	1	140	*4·0*
Major Dysfunction Group	18	*2·1*	38	*2·2*	25	*2·8*	—	81	*2·3*
Minor Dysfunction Group	63	*7·5*	139	*8·1*	68	*7·5*	2	272	*7·8*
Second Stage Dysfunction	18	*2·1*	59	*3·4*	32	*3·6*	1	110	*3·1*
Extrinsic Difficulty ("Other Causes")	34	*4·1*	51	*3·0*	24	*2·7*	—	109	*3·1*
Abnormal Presentations	25	*3·0*	45	*2·6*	24	*2·7*	1	95	*2·7*
Totals	840	*100*	1,721	*100*	901	*100*	42	3,504	*100*

to be found among the labours associated with mechanical difficulty. There is 14 times as much major mechanical difficulty among the short women as among the tall.

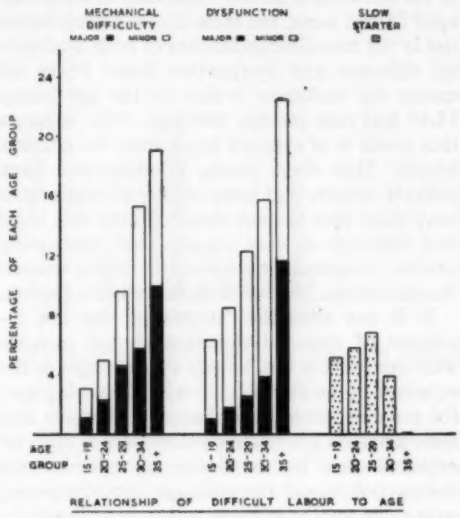
In a previous report (Bernard, 1952), it has been shown that height is closely related to the capacity of the pelvis. With very few exceptions tall women (5 feet 4 inches or more) have pelves with adequate measurements and with brims of round or long oval shape. By contrast, a large proportion of short women (under 5 feet 1 inch) have small pelves, many of which show more or less flattening of the brim. This is particularly true of small women of poor social background and is mostly the result of inadequate nutrition. The results presented are therefore to be expected —more contracted pelves with decreasing height and therefore more mechanical difficulty arising from disproportion.

There is no significant difference in the frequency of difficulty due solely or mainly to dysfunction or "slow starting".

(2) *Age*

It is well established clinically that Caesarean section and forceps delivery are more frequent among primigravidae over 30 years of age than among younger women. It is important to discover whether this increased incidence of operative delivery results from ageing of the tissues most concerned or from an increased frequency of such "extrinsic" factors as hypertension, diabetes, or greater concern for the baby of the elderly primigravidae.

The occurrence of each type of difficult labour among primigravidae arranged by 5-year groups is shown in Table III and, in part, in Graph B.



GRAPH B

TABLE III

Labour in 3,504 Primigravidae Grouped by Age

CLASS OF LABOUR	AGE GROUPS											
	15–19		20–24		25–29		30–34		35+		All Ages	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Normal Labour	357	*79·4*	1,337	*74·4*	520	*59·3*	141	*54·0*	39	*32·2*	2,394	*68·3*
"Slow Starters"	23	*5·1*	102	*5·7*	59	*6·7*	10	*3·8*	0	*0*	194	*5·5*
Major Mechanical Group ..	5	*1·1*	39	*2·2*	38	*4·3*	15	*5·7*	12	*9·9*	109	*3·1*
Minor Mechanical Group ..	9	*2·0*	49	*2·7*	46	*5·3*	25	*9·6*	11	*9·1*	140	*4·0*
Major Dysfunction Group ..	4	*0·9*	31	*1·7*	22	*2·5*	10	*3·8*	14	*11·6*	81	*2·3*
Minor Dysfunction Group ..	24	*5·4*	120	*6·7*	85	*9·7*	31	*11·9*	12	*9·9*	272	*7·8*
Second Stage Dysfunction ..	7	*1·6*	40	*2·2*	37	*4·2*	16	*6·2*	10	*8·3*	110	*3·1*
Extrinsic Difficulty ("Other Causes")	5	*1·1*	40	*2·2*	40	*4·6*	9	*3·4*	15	*12·4*	109	*3·1*
Abnormal Presentations	14	*3·1*	39	*2·2*	30	*3·4*	4	*1·5*	8	*6·6*	95	*2·7*
TOTALS	448	*100*	1,797	*100*	877	*100*	261	*100*	121	*100*	3,504	*100*

Normal labour occurs in nearly 80 per cent of women under 20, but with increasing age the figure falls to 32 per cent in the 35 and over group.

"Slow starting" does not seem to be related to age and neither does difficulty due to abnormal presentations. Abnormal labour due to "extrinsic difficulty" accounts for a proportion of the increased difficulty, especially in the group aged 35 and more, but there is also a progressive rise in the true difficult labours of both mechanical difficulty and dysfunction types. From all causes the incidence is least in the age group 15-19 and rises steadily with age. This suggests that youth is of extreme importance for efficient labour. That some young primigravidae have difficult labours and some elderly primigravidae have short easy labours does not alter this basic fact although it does suggest that the ageing process progresses more slowly in some women than in others. No doubt there are other factors.

It is not altogether surprising that the incidence of major dysfunction should increase with age for it is well known that changes in the structure of the uterus occur with advancing age; for example, such gross changes as fibroids and endometriosis are relatively common. It is to be expected that the incidence of second stage dysfunction would rise with age since the young woman is as a rule more active and should be able to use the abdominal muscles and relax the muscles of the pelvic floor more efficiently.

It is less easy to explain why mechanical difficulties should increase so markedly with age.

The relation between nutrition, pelvic form and height has already been discussed. If the older women in our group had been less well nourished in childhood than the younger ones, they might be expected to show more evidence of stunted growth. But as Table IV shows the older groups of patients include rather more tall and less short women than the younger groups, due probably to the larger representation of upper social class (well nourished) women among the older primigravidae. There is, therefore, no evidence to suggest that the increase in mechanical difficulty in labour in the older women is due to a higher incidence of contracted pelvis.

In this series the weight of the baby has been found to be almost unaffected by increasing maternal age whilst Karn and Penrose (1951) found a slight but negative correlation in a very much larger series of cases.

We are thus driven to the conclusion that the rising incidence of mechanical difficulty with age may in part be due to increased rigidity of the pelvic joints and ligaments. This prevents the temporary increase in pelvic capacity said to occur during labour in young women as the result of slight stretching. In addition the ageing process may increase resistance to the birth of the head by diminishing the elasticity of the tissues of the pelvic floor and perineum, but very little accurate information is available on this subject. The importance of youth is, however, emphasized by the data in Table IV. Age group 15 to 19 contains fewest tall and most short women and therefore by inference has the highest incidence of contracted pelvis. Yet the incidence of major mechanical difficulty rises steadily with age and in the age group 30 to 34 is 5 times that in age group 15 to 19. It may well be that in addition the uterus of the young woman possesses a reserve of power which enables it to overcome, relatively easily, considerable obstruction to the

TABLE IV

Height Distribution of 3,504 Primigravidae by Age Groups

Age Group	Short		Medium		Tall		Not Stated		Totals	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
15–19	121	*27·0*	227	*50·5*	91	*20·5*	9	*2·0*	448	*100*
20–24	436	*24·3*	904	*50·3*	439	*25·0*	18	*1·0*	1797	*100*
25–29	192	*22·9*	416	*47·3*	255	*29·0*	14	*1·6*	877	*100*
30+	91	*23·8*	174	*45·5*	116	*30·4*	1	*0·3*	382	*100*
All Age Groups	840	*24·0*	1,721	*49·0*	901	*25·7*	42	*1·2*	3,504	

birth of the child. These facts may help to explain why it is so difficult to foretell correctly the outcome of labour in cases of borderline disproportion.

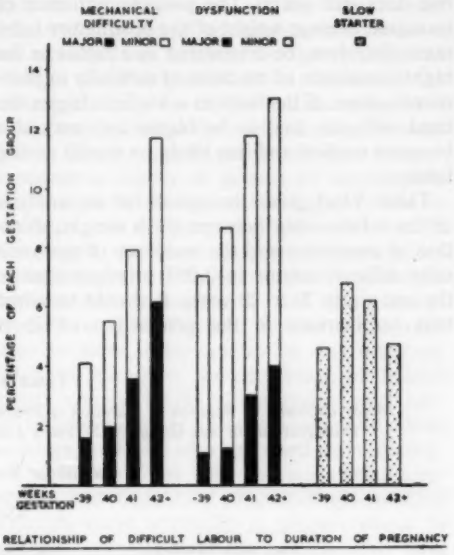
(3) *Duration of Pregnancy*

This part of the study has been restricted to cases in which the estimated duration of pregnancy was thought to be reasonably accurate—patients who professed early in pregnancy to be certain of the exact date of their last menstrual period and who previously had normal regular menstrual cycles; 3,092 of the 3,504 primigravidae satisfied these provisions.

They were subdivided according to the time of onset of labour into four groups: before the 40th week, in the 40th and 41st and after the 41st week.

Table V and Graph C show the occurrence of difficult labour in these groups.

Abnormal presentations, as expected, are more common in the group which includes cases of premature labour. There is a progressive increase in the incidence of mechanical difficulty and dysfunction the longer pregnancy is prolonged past term. This is not due to the effect of age for we have found in this and other investigations that age has no influence on the incidence of postmaturity.



GRAPH C

Thomson (1951) has shown that the mean foetal weight begins to level off in the 10th lunar month after a rapid rise in the 7th, 8th and 9th month. During the 4 weeks after term a slight

TABLE V

Labour in 3,504 Primigravidae Grouped by Duration of Pregnancy

CLASS OF LABOUR	DURATION OF PREGNANCY											
	Less than 40 weeks		40th week		41st week		More than 41 weeks		Duration Uncertain		All Cases	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Normal Labour	605	*73·2*	495	*71·4*	532	*65·4*	465	*61·3*	297	*72·1*	2,394	*68·3*
"Slow Starters"	38	*4·6*	47	*6·8*	51	*6·3*	36	*4·7*	22	*5·3*	194	*5·5*
Major Mechanical Group ..	13	*1·6*	13	*1·9*	29	*3·6*	47	*6·2*	7	*1·7*	109	*3·1*
Minor Mechanical Group ..	21	*2·5*	25	*3·6*	35	*4·3*	42	*5·5*	17	*4·1*	140	*4·0*
Major Dysfunction Group ..	9	*1·1*	9	*1·3*	25	*3·1*	34	*4·5*	4	*1·0*	81	*2·3*
Minor Dysfunction Group ..	50	*6·0*	51	*7·4*	71	*8·7*	69	*9·1*	31	*7·5*	272	*7·8*
Second Stage Dysfunction ..	22	*2·7*	23	*3·3*	31	*3·8*	25	*3·3*	9	*2·2*	110	*3·1*
Extrinsic Difficulty ("Other Causes")	31	*3·7*	20	*2·9*	22	*2·7*	26	*3·4*	10	*2·4*	109	*3·1*
Abnormal Presentations	38	*4·6*	10	*1·4*	17	*2·1*	15	*2·0*	15	*3·6*	95	*2·7*
TOTALS	827	*100*	693	*100*	813	*100*	759	*100*	412	*100*	3,504	*100*

rise does still occur. The possible influence of increased average weight of the postmature baby must, therefore, be considered as a factor in the higher incidence of mechanical difficulty in postmature cases. If the baby as a whole is bigger the head will also tend to be bigger and may also be more ossified and less likely to mould during labour.

Table VI(*a*) gives the results of an analysis of the relationship between birth weight, duration of pregnancy and the incidence of mechanically difficult labour in 2,967 primigravidae in the age group 20 to 29 years. It should be noted that no increase in the proportion of short women, and thus by inference of contracted pelvis, was found in the postmature group.

There are twice as many babies weighing 8 pounds or more in the group in which labour began after the 41st week when compared with the 39th week group. Irrespective of the time of onset of labour the incidence of difficult labour due to mechanical causes increases as the weight of the baby increases. The high figure of 10 per cent major mechanical difficulty after the 41st week, when the infant weighs over 8 pounds, must be due to some extent to the progressive increase in the weight of the baby as the pregnancy continues beyond term.

TABLE VI(*a*) and (*b*)

Major Difficulty in Relation to Duration of Pregnancy and Birth Weight in 2,967 Booked Married City Primigravidae in Age Group 20-29 Years Delivered between the Years 1948 and 1952 inclusive

(*a*) *Major Mechanical Difficulty*

Birth Weight	Duration of Pregnancy											
	Less than 39 weeks			39 weeks			40 and 41 weeks			More than 41 weeks		
	Total Cases	No. Cases of Mech. Diff.	Per Cent Mech. Diff.	Total Cases	No. Cases of Mech. Diff.	Per Cent Mech. Diff.	Total Cases	No. Cases of Mech. Diff.	Per Cent Mech. Diff.	Total Cases	No. Cases of Mech. Diff.	Per Cent Mech. Diff.
Under 7½ lb. ..	349 (90·9%)	2	0·6	302 (76·6%)	3	1·0	896 (62·0%)	17	1·9	384 (51·5%)	14	3·6
7½–8 lb. ..	23 (6·0%)	—	—	44 (11·2%)	2	4·5	283 (19·6%)	5	1·8	144 (19·3%)	4	2·8
8 lb. and over	12 (3·1%)	—	—	48 (12·2%)	2	4·2	265 (18·4%)	11	4·2	217 (29·1%)	22	10·1
All Weights	384 (100%)	2	0·5	394 (100%)	7	1·8	1,444 (100%)	33	2·3	745 (100%)	40	5·4

(*b*) *Major Dysfunction*

Duration of Pregnancy												
Less than 39 weeks			39 weeks			40 and 41 weeks			More than 41 weeks			
Total Cases	No. Cases Dysfunction	Per Cent Dysfunction	Total Cases	No. Cases Dysfunction	Per Cent Dysfunction	Total Cases	No. Cases Dysfunction	Per Cent Dysfunction	Total Cases	No. Cases Dysfunction	Per Cent Dysfunction
384	2	0·5	394	3	0·8	1,444	21	1·4	745	16	2·1

Table VI(*b*) shows that in the same group the proportion of major difficulty due solely or mainly to uterine dysfunction rises from 0·8 per cent at 39 weeks to 2·1 per cent after 41 weeks.

There are two possible reasons for this: either uterine function is most efficient at term and becomes less so if pregnancy is protracted or, alternatively, the factor which postpones the onset of labour is also associated with uterine dysfunction.

The true explanation is of some practical importance, since, if prolongation of pregnancy beyond term merely means that the uterus has "missed the bus", as it were, there would be a clear indication for inducing labour at term, an indication which is strengthened by the recent findings of Walker (1954), that the foetus suffers increasing oxygen deprivation beyond 40 weeks. If, on the other hand, postmaturity is just one indication of fundamentally inadequate uterine function, then induction is likely to fail and may even increase the risks of prolonged labour by adding the hazard of ruptured membranes. Walker has reported very encouraging results, however, from a pilot study of induction, judged by a decrease in the incidence of difficult labour and of stillbirths.

"Slow starters" show no comparable rise in incidence with prolongation of the pregnancy (Table V). Furthermore there is no significant rise in the incidence of "Second stage dysfunction". By contrast this latter type of difficulty does increase with age. It therefore seems probable that postmaturity is in some way related to uterine efficiency but does not affect the action of the abdominal muscles, while age has an effect on both uterine and voluntary muscle.

(4) *Other Factors which may Influence Efficiency in Labour*

While the relationships shown between age, height and duration of pregnancy and difficult labour may be true as generalizations, there are many individual exceptions. Difficult labour is commoner among elderly primigravidae with postmaturity than among young women who go into labour at term. But some young women in labour at term have severe dysfunction and some older women past term have quick and easy labours. It has frequently been suggested that emotional tension or fear may cause abnormal function of the uterus, and attention has recently been focussed on this through the writings of Grantly Dick Read. Obviously the matter can only be settled satisfactorily by a careful psychological study of individual women. Failing this, it is reasonable to compare the performance in labour of groups of women who can be expected to approach pregnancy and its problems with differing emotional attitudes. In this respect we have assumed that unmarried mothers have considerable reason for emotional conflicts during pregnancy, and also, though possibly to a lesser extent, women who marry, often in haste, after conception has occurred. Table VII compares the occurrence of difficult labour among 1,876 primigravidae who conceived *after* marriage; 734 who conceived *before* marriage, and 409 who remained unmarried.

The figures show that the pre-marital conception and illegitimate pregnancy groups have distinctly more normality in labour (about 74 per cent normal) than the women who were married before becoming pregnant (63·3 per cent normal).

This certainly does not support any suggestion that emotional disturbances influence labour adversely, but surely cannot mean that the married state predisposes to difficult labour. One must look for other differences between the groups, and in fact further analysis shows that much of the difference between the three groups in the incidence of true difficult labour can be accounted for by differences in age. The emotional disturbances associated with illegitimacy and pre-nuptial conception therefore do not seem to affect the progress or efficiency of labour. If psychological factors do play a part in causing uterine dysfunction they must be much more deep seated and would, therefore, require special techniques for their elucidation.

Summary

(1) A classification of normal and abnormal labour is described by means of which difficult labours can be grouped according to the cause and degree of difficulty.

(2) Among single pregnancies in which the vertex presents, "intrinsic" difficulty is caused either by mechanical interference in the descent

TABLE VII

Labour in 3,019 Primigravidae Grouped by Marital Status

Class of Labour	Marital Status: 2,610 Booked Married Primigravidae 1949-51 — Conceived after marriage		Conceived before marriage		Unmarried Primigravidae 1948-51		All Cases	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Normal Labour	1,193	*63·6*	548	*74·7*	301	*73·6*	2,042	*67·6*
"Slow Starters"	111	*5·9*	44	*6·0*	40	*9·8*	195	*6·5*
Major Mechanical Group	70	*3·7*	12	*1·6*	8	*2·0*	90	*3·0*
Minor Mechanical Group	85	*4·5*	25	*3·4*	8	*2·0*	118	*3·9*
Major Dysfunction Group	57	*3·0*	10	*1·4*	7	*1·7*	74	*2·5*
Minor Dysfunction Group	170	*9·1*	43	*5·9*	19	*4·6*	232	*7·7*
Second Stage Dysfunction	71	*3·8*	16	*2·2*	10	*2·4*	97	*3·2*
Extrinsic Difficulty ("Other Causes")	70	*3·7*	13	*1·8*	7	*1·7*	90	*3·0*
Abnormal Presentations	49	*2·6*	23	*3·1*	9	*2·2*	81	*2·7*
TOTALS	1,876	*100*	734	*100*	409	*100*	3,019	*100*

of the head through the pelvis or by dysfunction (abnormal uterine action or undue resistance of the soft tissues) or by a combination of both these factors. Difficulty may also arise from "extrinsic" causes which necessitate surgical interference during an essentially normal labour in the interests of mother or foetus.

(3) Duration of labour is not a reliable indication of uterine dysfunction, as about one-third of labours lasting over 24 hours follow a characteristic "slow starter" pattern in which a variable period of relative inactivity is followed by an essentially normal labour. This phenomenon appears to be quite different from true uterine dysfunction.

(4) A study of a representative group of primigravidae shows that:

(*a*) Mechanical difficulty in labour is related to short stature, which is known to be related to small size or abnormal shape of the pelvic brim. Dysfunction is not related to height.

(*b*) Both mechanical difficulty and dysfunction increase progressively with increasing age. It is suggested that the main cause of this is a deterioration in uterine efficiency with age.

(*c*) Both mechanical difficulty and dysfunction become more common the longer pregnancy is prolonged past term. This may be partly explained by greater size of the foetus, but it is suggested that there may also be some causal relationship between postmaturity and uterine dysfunction in labour.

(*d*) Any psychological disturbances which may be assumed to be associated with anomalous marital status do not appear to influence the occurrence of difficult labour.

(5) The classification of labour which is described is a useful research tool and may, by providing information about the factors related to each type of difficult labour, give some clue to the causes of disordered uterine action.

ACKNOWLEDGMENTS

Our thanks are due to Professor Dugald Baird for much helpful advice and criticism, and to the Records staffs of the Maternity Hospital and Midwifery Department for the preparation of data.

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CHORIONEPITHELIOMA IN MOTHER AND INFANT

BY

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AND

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THE transmission of malignant disease between mother and infant is a very rare event, and, according to our examination of the literature, the presence of chorionepithelioma in both mother and infant has not been recorded. The following case is therefore reported.

CASE REPORT

History of Infant: D.S., a male, was born on the 29th October, 1952, and was admitted to Christchurch Hospital at the age of 7 weeks. The relatives stated that the child had made satisfactory progress, apart from occasional slight vomiting, until about 10 days before admission. Recently, he had become progressively paler, and had developed abdominal distension. The family doctor, however, thought that some enlargement of the abdomen had been present since birth.

On examination, he was seen to be a very pale, extremely ill child. The hearts and lungs showed no abnormality. The abdomen was distended and tense, and an irregular mass was palpable in the epigastrium. A small blood-transfusion was given, but the child died about 18 hours after admission.

Necropsy Findings: The infant was extremely anaemic. The abdomen was distended, but there was no ascites. The liver was grossly enlarged, weighing 534 grammes (normal weight at this age is 130 grammes). There was a large, irregular, rounded swelling of the under surface of the left lobe (Fig. 1), but on cutting the liver the tumour was found to spread well into the right lobe without distorting the surface. It was seen to be composed of a series of blood-cysts (Fig. 2), and, on naked-eye examination, a tentative diagnosis of haemangio-blastoma was made. The heart was normal, and the lungs, which were free from secondary deposits, showed only congestion of the posterior dependent parts. There was a small deposit of growth in the sixth right rib at the costo-chondral junction, and also a small deposit in the glands in the portal fissure. The intestinal tract, kidneys, spleen, suprarenal glands, and testes were normal.

Histological examination of the tumours showed quite clearly the structure of a chorionepithelioma, typical Langhans' cells and syncytial masses being present at the margins of spaces containing blood (Figs. 3 and 4).

History of Mother: Mrs. S., aged 25 years, had had 3 children. She was admitted to Poole Hospital on 4th January, 1953, complaining of continuous vaginal bleeding since the birth of her last infant nine weeks previously. The delivery had been normal. Her general condition was good, but the uterus was retroverted and enlarged to the size of a 10-weeks' pregnancy. A diagnosis of retained products of conception was made, the uterus was explored on 6th January, 1953, and the material obtained showed a typical chorionepithelioma.

On 16th January, 1953, a total hysterectomy with bilateral salpingo-oöphorectomy was performed. At operation there appeared to be some extension of the growth on the right side of the uterus at the level of the internal os, and it was necessary to expose the ureter and displace it laterally in order to remove the whole mass complete. As there was some induration in this area, the patient was given a course of pelvic deep X-ray therapy after her operation. Recovery was uneventful, and when last seen, 11 months after the operation, she was in good health, showing no signs of a recurrence.

Pathological Report: The posterior half of the bisected uterus shows a round, haemorrhagic area of growth, approximately 10 mm. in diameter, in the right cornu (Fig. 5). Histological examination of this area showed actively invasive chorionepithelioma (Fig. 6). Mitotic figures were numerous, and there was much pyknosis and variation in nuclear staining. Sections were also taken from a suspected area in the region of the internal os, but these revealed no growth. The ovaries showed no lutein cysts, but these, according to Novak (1952), only occur in 9·4 per cent of cases of chorionepithelioma.

Further Investigations: On the 14th January, 1953, the urinary pregnanediol was found to be less than 2 mg. per day, and the Hogben test was negative. The latter test was repeated twice, the last time on the 19th October, 1953, and remained unchanged. In January and again in July, X-ray films of the chest were normal.

DISCUSSION

The metastasis of a maternal tumour to the foetus is an event of great rarity, and the

reported cases have been reviewed by Willis (1952). It has been recorded in connexion with a carcinomatous growth, possibly of hepatic origin (Friedreich, 1866), generalized lymphosarcomatosis (Berghinz, 1900), Hodgkin's disease (Priesel and Winkelbauer, 1926), and in malignant melanoma (Weber, Schwarz, and Hellenschmied, 1931; Holland, 1949).

Willis remarks: "The possible metastasis of maternal chorionepithelioma—on *a priori* grounds not an unlikely event—may have actually taken place in the remarkable case reported by Emery (1952)." In his case, a tumour, histologically a chorionepithelioma, was found in the liver and lungs of an infant, which died at the age of 48 days. The mother, however, showed no sign of a similar growth, being under observation for 10 months after delivery. Emery suggested that a chorionepithelioma developing in the placenta late in pregnancy might have been expelled completely unnoticed with the afterbirth. He noted hyperplasia of the interstitial cells of the testes, which he attributed to the tumour's hormonal influence. Unfortunately, in our case the testes were not preserved for microscopical examination.

In the case recorded here, the chorionepithelioma in addition to invading the uterine wall had clearly given rise to metastases in the foetus.

Summary

A case of chorionepithelioma, invading the maternal uterus and giving rise to metastases in the infant, is recorded.

We wish to thank Dr. D. W. Beynon for the clinical notes on the infant and Dr. T. A. J. Wickham for the pathological work at Poole Hospital.

The specimens of the mother's uterus and the infant's liver have been presented to the Museum of the Royal College of Obstetricians and Gynaecologists.

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FIG. 1

Under surface of the liver of the infant.

FIG. 2

Cut surface of the liver of the infant.

E.W.C.B., T.K.O. [330]

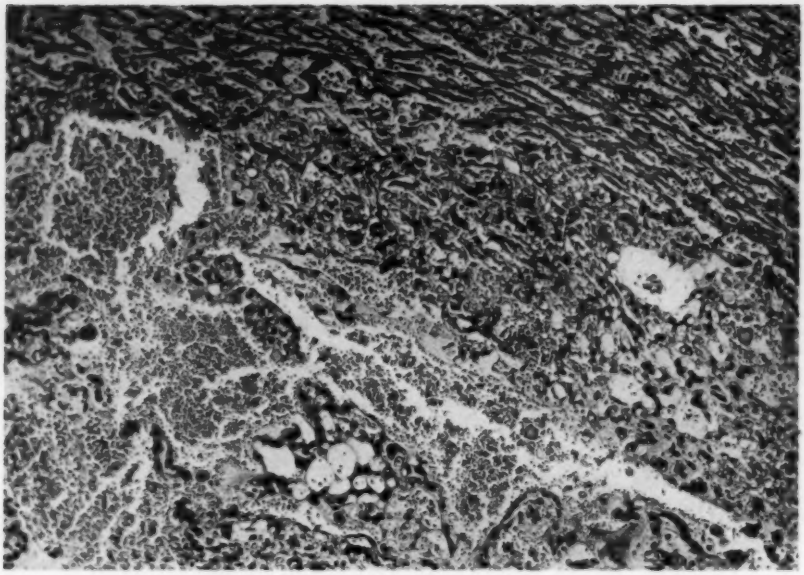

FIG. 3

Section of the tumour of the liver. ×120.

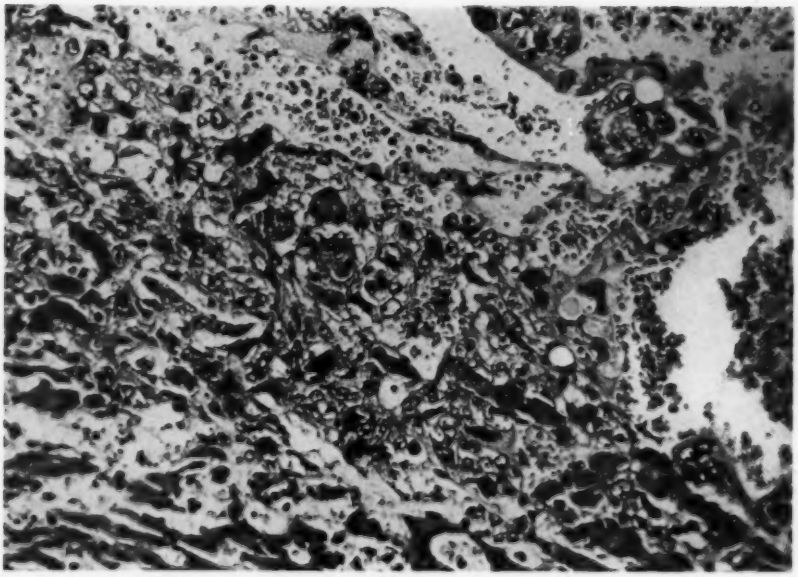

FIG. 4

Section of the tumour of the liver. ×260.

E.W.C.B., T.K.O.

FIG. 5

The uterus, showing growth in the right cornu.

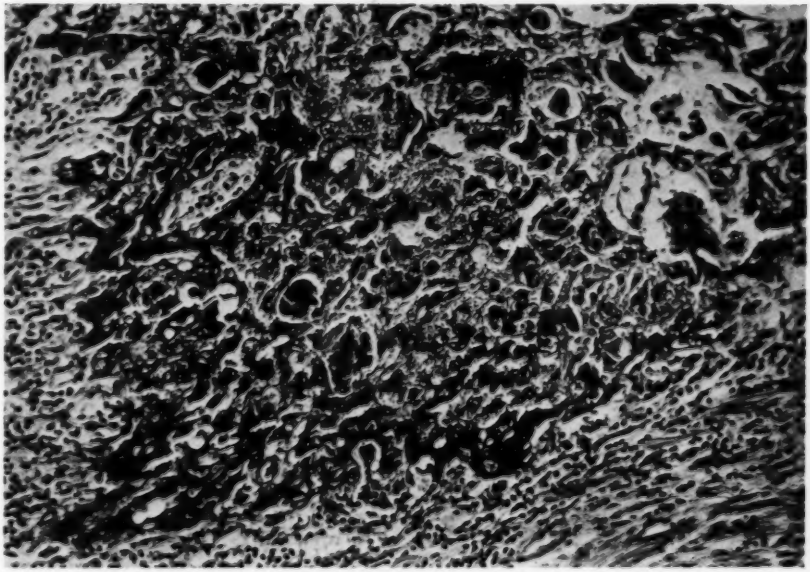

FIG. 6

Section of the uterine growth. ×240.

E.W.C.B., T.K.O.

PROLONGED LABOUR IN MULTIPARAE

BY

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ALTHOUGH the Registrar General's reports for the years 1942-1951 inclusive show that multiparae provided more than 50 per cent of the total births for England and Wales, this large section of the population has attracted little attention.

It is true that from time to time mention is made of the various problems presented by the "Grand Multipara" (Robinson, 1930; Solomons, 1934; Williams, 1947; Calkins, 1949), but these cases are becoming increasingly rare and information upon them is of little value when considering the infinitely more common multipara of low parity.

There would seem to be two causes of this apparent neglect of such a nationally important group of cases. In the first place, the greater incidence of abnormal labours in primiparae renders these patients of greater medical interest while secondly, since the management of dystocia in general depends more upon its cause and nature than upon the parity of the patient, specific references to multiparae become to a large extent unnecessary.

While such an approach is perfectly satisfactory with regard to the management of individual cases, it fails to provide information upon the incidence and course of the various types of abnormal labour in multiparae as a separate clinical group.

Such information, in particular when it can be related to the course of the first labour, should, however, be valuable for the following reasons:

1. To assess the relative claims of various multiparae to delivery in hospital.

2. To provide means of giving the patient more solid assurances as to the probable outcome of a future labour. There is reason to believe that fear engendered during a past confinement may have an important bearing upon whether a woman becomes pregnant for a second time (Jeffcoate, 1949; Steer, 1950), while the effect of the emotions upon the course of labour is already too well-known to require further comment.

For this reason a survey has recently been carried out of 1,000 consecutive secundiparae delivered in University College Obstetric Hospital during the period July, 1948 to March, 1953, with the object of studying the incidence and types of dystocia to which such a class of patient is prone. In addition, an attempt has been made to determine whether any relationship exists between abnormalities arising in the course of the first labour and those complicating the second delivery.

The following paper deals with the incidence, the management and the foetal and maternal hazards of prolonged labour in the above group.

PROLONGED LABOUR

Although standard text-books state that normal labour should be of under 24-hours' duration—estimates varying between 16 to 20 hours for primiparae and 8 to 12 hours for multiparae—no agreement appears to have been reached upon what constitutes an abnormally prolonged labour. Thus both Greenhill (1952) and Daro and Gollin (1951) believe that any labour lasting over 18 hours should be included in this category, while MacRae (1949) suggests that only cases where the first stage is of over 24-hours duration should qualify for this description. Between these two extremes lies the bulk of present-day opinion (Douglas and Stander, 1943; Odell *et al.*, 1947; Schmitz *et al.*, 1947; Mengert, 1950; Winterringer, 1951; Starr,

1952). It is therefore only to be expected that figures relating to the incidence of prolonged labour should show considerable variation, such variations ranging from 1·2 per cent to 5·0 per cent (Odell *et al.*, 1947; Schmitz *et al.*, 1947; Bradford *et al.*, 1949; MacRae, 1949; Mengert, 1950; Winterringer, 1951; Starr, 1952).

These figures, moreover, represent the total clinic incidence of long labours, primiparae and multiparae being considered together; and only those of Stern (1948) are of value in determining the relative frequency of this complication in these two groups of patients. Stern showed that labours of over 48 hours occurred in 7·9 per cent of primiparae and in only 1·7 per cent of all multiparae. However, since all types of multiparae were considered together, this finding cannot be taken as representative for multiparae of low parity. Nevertheless, the fact that long labours are not infrequently encountered in these patients renders it advisable to explore its incidence and hazards more closely. With regard to these hazards, although they have recently attracted considerable attention (Peckham, 1932; Douglas and Stander, 1943; Schmitz *et al.*, 1947; Stern, 1948; Bradford *et al.*, 1949; MacRae, 1949; Jeffcoate, 1949, 1950; Mengert, 1950; Corner *et al.*, 1951; Winterringer, 1951; Nixon, 1952; Starr, 1952), it is by no means clear whether they obtain with the same severity in multiparae as in primiparae. Nor is it clear whether the causes of inertia are the same in the two groups of patients. Lastly, it does not appear to have been definitely established whether uterine inertia is more likely to be encountered in a second labour when it has already complicated the first, although Jeffcoate (1949) suggests that this is usually not the case where the first confinement has ended in a vaginal delivery.

The Present Series

The material for the present paper was derived from the analysis of the records of 1,000 secundiparae. Of these patients 475 had been delivered of their first infants in University College Obstetric Hospital—Category I—while 525 had their first confinement elsewhere—Category II. From these original 1,000 cases the following were excluded:

1. Multiple pregnancies—19 cases.
2. Elective Caesarean sections—35 cases.
3. Cases where a previous Caesarean section had been necessary—33 cases.

With regard to this last group it was felt that such cases should be considered more as primiparae than multiparae.

The number of cases analyzed from the point of view of the second delivery thus totalled 913. In these the method of delivery in the second labour was as follows:

	Category I	Category II	Total	per cent
Spontaneous Vertex	413	454	867	(95·0)
Forceps	7	14	21	(2·3)
Breech	5	10	15	(1·6)
Caesarean section ..	4	6	10	(1·1)
Total ..	429	484	913	

Detailed information upon the first delivery was only available in cases belonging to Category I—475 in all. After excluding multiple pregnancies and elective Caesarean sections there remained 459 cases in which the course of the first labour could be compared with that of the second. In these patients the method of delivery in the first labour was as follows:

Spontaneous vertex	338	(73·6 per cent)
Forceps	74	(16·1 per cent)
Breech	22	(4·8 per cent)
Caesarean section	25	(6·5 per cent)

The Duration of Labour

The duration of the second labour in the cases analyzed is shown in Table I.

The numbers of labours of from 24- to 48-hours duration and of over 48 hours—7·2 per cent and 1·1 per cent respectively—are slightly lower than the comparable figures given by Stern (1948) of 10·5 per cent and 1·7 per cent.* This may be due to the fact that the present investigation is concerned only with secundiparae, prolonged labour being reputed to be more frequent in patients of higher parity (Robinson, 1930), some of whom would necessarily have been included in Stern's series.

* The 24- to 48-hour proportion for the present series is significantly lower than that of Stern.

TABLE I
The Duration of the Second Labour
(Percentages in brackets)

	Under 24 hours	24–48 hours	Over 48 hours	Total
Category I	390 (90·9)	34 (7·9)	5 (1·2)	429
Category II	447 (92·4)	32 (6·6)	5 (1·0)	484
Total	837 (91·7)	66 (7·2)	10 (1·1)	913

Table II relates to the duration of the first labour in the present series. The high incidence of prolonged labours may in part be due to the fact that a considerable proportion of cases admitted to hospital for their second confinement were those in whom the first labour was abnormal.

TABLE II
The Duration of the First Labour
(Category I only)

Under 24 hours	24–48 hours	Over 48 hours	Total
318 (69·3)	97 (21·1)	44 (9·6)	459

THE INCIDENCE OF OPERATIVE DELIVERIES

It is generally conceded that operative deliveries—either with the forceps or by Caesarean section—are more common in long labours. The actual incidence of such deliveries is variously given as 3·5 per cent (Schmitz *et al.*, 1947) and 73·6 per cent (MacRae, 1949). That this incidence is proportional to the duration of labour has been shown by Stern (1948) in whose series the number of cases thus delivered rose from 13·7 per cent in labours of between 24- and 48-hours duration to 34·0 per cent for labours lasting over 120 hours.

Differentiation between primiparae and multiparae in this respect does not, however, appear to have been attempted by any observer with the exception of Bradford *et al.* (1949) who, in a small series of cases, showed that operative interference in long labours was slightly less frequent in multiparae.

With regard to the present series, the incidence of operative deliveries in multiparae is shown in Table III; while, for the sake of comparison, that obtaining in the same patients in their first labour is shown in Table IV.

TABLE III
The Method of Delivery in Relation to the Duration of Labour
(*Second Labours*)

Duration of Labour	Spontaneous Delivery	Forceps Delivery	Breech Delivery	Caesarean Section	Total
Under 24 hours	794 (94·8)	20 (2·4)	14 (1·7)	9 (1·1)	837
24–48 hours	64 (97·0)	1 (1·5)	1 (1·5)	—	66
Over 48 hours	9 (90·0)	—	—	1 (10·0)	10

TABLE IV
The Method of Delivery in Relation to the Duration of Labour
(*First Labours*)

Duration of Labour	Spontaneous Delivery	Forceps Delivery	Breech Delivery	Caesarean Section	Total
Under 24 hours	256 (80·5)	36 (11·3)	15 (4·7)	11 (3·5)	318
24–48 hours	62 (63·9)	23 (23·7)	6 (6·2)	6 (6·2)	97
Over 48 hours	20 (45·4)	15 (34·1)	1 (2·3)	8 (18·2)	44

Comparison of these tables shows that while the incidence of operative deliveries—forceps and Caesarean sections—in first labours prolonged over 24 hours was 36·9 per cent, as against 14·8 per cent for labours of under this duration, in multiparae no such rise was apparent. In the latter patients operative interference was only necessary in 2·6 per cent of cases where labour exceeded 24 hours compared with an incidence of 3·5 per cent where delivery was completed under this time limit.

Although the numbers involved are admittedly small, they do suggest that in second deliveries the rate of operative interference is not related to the duration of labour.

Perinatal Mortality

Comparison of the foetal loss in second labours with that observed in the first is made in Tables V and VI.

In both these tables it will be noted that the gross perinatal loss is not significantly different in long and short labours. Although at first sight such a finding would seem to be contrary to the accepted view that the foetal loss is proportional *inter alia* to the length of labour (Peckham, 1932; Stern, 1948; Nixon, 1952; Starr, 1952) the explanation is that a great proportion of the foetal deaths in labours under 24 hours occurred in connexion with premature or malformed infants, delivery being characteristically rapid in such cases (Diddle and Plass, 1942).

When all infants under 5½ pounds birth weight and all instances of gross foetal malformation are excluded, the effects of the duration of labour upon the chances of the infant's survival in the present series are shown in Tables VII and VIII.

These figures suggest that, while in primiparae an upward trend in the foetal mortality occurs

Table V

Gross Perinatal Loss associated with the Second Labour

Duration of Labour	Total Cases	Stillbirths	Neonatal Deaths	Infants Alive	Perinatal Loss Per cent
Under 24 hours	837	13	14	810	3·2
24–48 hours	66	—	1	65	1·5
Over 48 hours	10	—	—	10	—

Table VI

Gross Perinatal Loss associated with the First Labour

Duration of Labour	Total Cases	Stillbirths	Neonatal Deaths	Infants Alive	Perinatal Loss Per cent
Under 24 hours	318	16	11	291	8·5
24–48 hours	97	3	4	90	7·2
Over 48 hours	44	3	1	40	9·1

Table VII

The Corrected Perinatal Loss associated with the Second Labour

Duration of Labour	Total Cases	Perinatal Loss	Infants Alive	Perinatal Loss Per cent
Under 24 hours	791	9	782	1·1
24–48 hours	60	—	60	—
Over 48 hours	9	—	9	—

TABLE VIII
The Corrected Perinatal Loss associated with the First Labour

Duration of Labour	Total Cases	Perinatal Loss	Infants Alive	Perinatal Loss Per cent
Under 24 hours	280	8	272	2·9
24–48 hours	88	2	86	2·3
Over 48 hours	41	2	39	4·9

after labour has lasted over 48 hours, no such rise is seen in the case of multiparae. In the present series, however, these figures possess no statistical significance, possibly owing to the fact that the numbers concerned are too small. One explanation of the apparent difference, however, is that hypertonic uterine inertia and cervical dystocia—characteristically associated with placental ischaemia and consequent foetal death from anoxia—are rare in multiparae (Arthur, 1949; MacRae, 1949; Jeffcoate, 1949, 1950). Such a view receives support in the present series from the absence of foetal distress—as evinced by the low rate of operative delivery—in multiparae in whom labour was prolonged (Table III).

PUERPERAL MORBIDITY

The incidence of puerperal morbidity in relation to the duration of labour is shown in Tables IX and X.

These results are in general accordance with the findings of others (Douglas and Stander, 1943; Bradford *et al.*, 1949; Winterringer, 1951; Nixon, 1952) to the effect that the maternal morbidity is related to the duration of labour and rises steeply after this has exceeded 48 hours. The fact that this rise is more marked, although not significantly so, in primiparae than in multiparae may be due to the increased rate of operative intervention in the former group of patients (Douglas and Stander, 1943).

THE RELATION BETWEEN THE LENGTH OF FIRST AND SECOND LABOURS

Comparison of the duration of first and second labours was possible only in Category I patients where delivery of a single foetus per vaginam had occurred in both the first and the second labours. Four hundred and twenty-five such cases were available for study, the analysis of which is shown in Table XI.

TABLE IX
Puerperal Morbidity after the Second Labour

Duration of Labour	Total Cases	Puerperium Normal	Puerperium Morbid	Morbid Puerperia Per cent
Under 24 hours	837	784	53	6·3
24–48 hours	66	62	4	6·1
Over 48 hours	10	9	1	10·0

TABLE X
Puerperal Morbidity after the First Labour

Duration of Labour	Total Cases	Puerperium Normal	Puerperium Morbid	Morbid Puerperia Per cent
Under 24 hours	318	288	30	9·4
24–48 hours	97	90	7	7·2
Over 48 hours	44	34	10	22·7

TABLE XI

Comparison of the Duration of the First and Second Labours

Duration of Second Labour	Duration of First Labour		
	Under 24 hours (301 cases)	24–48 hours (89 cases)	Over 48 hours (35 cases)
Under 24 hours	278 (92·3)	79 (88·8)	29 (82·9)
24–48 hours	19 (6·3)	9 (10·1)	6 (17·1)
Over 48 hours	4 (1·3)	1 (1·1)	—

According to the χ^2 Test, the relation between the first and second labours in the present series is not significant, although it is possible that with a larger number of cases some tendency for long labours to be repeated might be shown to exist.

THE CAUSE OF PROLONGED LABOUR IN MULTIPARAE

1. *Cervical Dystocia*

The view that cervical dystocia is rarely seen in multiparae (Arthur, 1949; MacRae, 1949; Jeffcoate, 1950) was borne out in the present series, only 1 such case being observed. Here delivery was effected by Caesarean section after labour had been in progress for over 48 hours. It is possible, however, that an element of disproportion was also present in this patient since the second infant was considerably heavier than the first.

2. *Malpositions of the Occiput*

It is commonly asserted that malpresentations, especially transverse or posterior positions of the occiput, are directly related to long labour (Stern, 1948; MacRae, 1949; Bradford *et al.*, 1949; Jeffcoate, 1949, 1950) although both Odell *et al.* (1947) and Schmitz *et al.* (1947) deny this. In the present series there was only 1 instance where 1 such malposition, of a degree to warrant operative intervention, was associated with a prolonged labour. This case was one of deep transverse arrest delivered by the forceps after a labour of between 24 and 48 hours. It may be argued, however, that a number of prolonged labours were associated with some initial malposition of the occiput which later underwent spontaneous correction and delivery. It is impossible to be definite on this point since accurate observations upon the position of the occiput during the first stage of labour were not available. Study of labours following previous forceps delivery might, however, shed some light upon this problem. Where the first delivery was complicated by a posterior or transverse position of the occiput it is reasonable to suppose that since, to some extent at least, this malposition is due to some pelvic abnormality, it would be liable to recur during a subsequent labour. If this is so, and if the position of the occiput affects the duration of labour, these labours should be prolonged. In Table XII the duration of labour after previous forceps delivery has been analyzed.

TABLE XII

The Duration of Labours after Previous Forceps Deliveries

Duration of Second Labour	Position of Occiput at First Delivery	
	Anterior (41 cases)	Posterior or Transverse (31 cases)
Under 24 hours ..	37	28
24–48 hours ..	4 (9·8)	3 (9·7)
Over 48 hours ..	—	—

It can be seen from the above table that, if posterior and transverse positions are considered together, 9·7 per cent of subsequent labours were of over 24-hours' duration as compared with 9·8 per cent of labours following occipito-anterior positions.

The similarity between these figures suggests two possibilities:

1. That occipito-posterior and occipito-transverse positions do not arise in the course of second labours, or

2. That, although such positions of the occiput do in fact occur, they have no influence upon the duration of labour.

3. *Disproportion*

As in the case of malpresentations, several authorities believe that minor degrees of disproportion predispose to prolonged labour (Dill *et al.*, 1948; Bradford *et al.*, 1949; Winterringer, 1951). These cases are often difficult to recognize since, with time, moulding of the foetal head will usually occur and be followed by a vaginal delivery, either spontaneous or instrumental.

An oblique approach to this question may be made by considering the difference between the weights of the first and second infants, since, if this is large, disproportion is more likely to have been present.

The results of the analysis of the infants' weights are shown in Table XIII.

The above table shows no significant difference in the relative weights of the first and second infants between labours lasting under 24 hours and those exceeding this duration. It is therefore reasonable to assume that in the series under discussion disproportion was not an aetiological factor in prolonged labours.

Conclusions

The following conclusions may be drawn from the cases analyzed in the previous paragraphs:

(1) The incidence of prolonged labour in secundiparae is low, being 7·2 per cent for labours of between 24- and 48-hours duration and 1·1 per cent where labour exceeds 48 hours. Since in many of the cases making up the present series the first labour had been abnormal, the incidence at large may well be even lower.

(2) In contradistinction to primiparae, the rate of operative interference in prolonged second labours is low (2·6 per cent) and shows no tendency to rise *pari passu* with the duration of labour.

(3) The risk to the infant in these cases is small. Although this is probably related to the low incidence of operative deliveries it may to some extent be due to the virtual absence of cervical dystocia and hypertonic uterine inertia in multiparae.

(4) The incidence of puerperal morbidity in multiparae is markedly lower than in primiparae. This may be due to the low rate of operative intervention in the former group of cases. The relationship of puerperal morbidity to the duration of labour is only significant in the case of primiparae.

(5) In the present series no significant relationship existed between the lengths of first and second labours. It is possible that in a larger series such a relationship might be shown to be present.

(6) With regard to the possible aetiology of long labour in multiparae, analysis of the present series suggests that cervical dystocia, hypertonic uterine inertia, malpresentations and disproportion rarely occurred. It is therefore probable that the great majority of such labours represent cases of simple hypotonic inertia, characterized by a low resting tone of the uterus and infrequent, weak contractions. The high rate of spontaneous deliveries indicates that with time the strength of the contractions increases to a satisfactory level, labour thenceforth being uneventful.

Table XIII

The Relation of the Weight of the Second Infant to that of the First

Duration of Second Labour	Weight of Second Infant in Relation to First			
	Less or Same	More		
		500–1,000 G.	1,000–1,500 G.	Over 1,500 G.
Under 24 hours (805 cases) ..	472 (58·7)	221 (27·5)	94 (11·7)	18 (2·1)
Over 24 hours (76 cases)	45 (59·2)	26 (34·2)	3 (3·9)	2 (2·7)

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THE MANAGEMENT OF ECLAMPSIA*

BY

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IN certain communities with closely-knit maternity services including a really adequate provision of antenatal beds, the incidence of eclampsia appears to be diminishing (Hamlin, 1952; Dawson, 1953). Yet it remains an important cause of maternal death in other areas. Table I records the incidence and mortality of the disease in St. Mary's Hospitals, Manchester, since my colleagues Gerrard and Newton (1932) published their important survey of the results from 1908 to 1931. The 402 mothers show a death rate of 12·4 per cent, while 38·6 per cent of the 376 babies failed to survive. It is not yet possible to assume that the disease in Manchester is becoming any milder, while the apparent reduction of the annual intake since 1948 is probably more expressive of the increasing stature of peripheral hospitals under the National Health Service than of any true reduction in eclampsia.

TABLE I

Year	No.	Maternal Deaths	Foetal Deaths
1932	22	4 (22·8%)	9/22 (40·9%)
1933	29	6 (20·6%)	5/26 (19·2%)
1934	31	4 (12·9%)	15/26 (57·7%)
1935	19	3 (15·8%)	5/17 (29·4%)
1936	20	4 (20·0%)	9/18 (50·0%)
1937	23	5 (21·3%)	9/19 (47·4%)
1938	9	0 (0%)	4/10 (40·0%)
1939	20	4 (20·0%)	7/13 (53·9%)
1940	17	1 (5·9%)	7/17 (41·2%)
1941	21	1 (4·8%)	9/22 (40·9%)
1942	14	3 (21·4%)	5/13 (38·5%)
1943	13	0 (0%)	3/13 (23%)
1944	31	5 (16·1%)	12/28 (25%)
1945	15	1 (6·7%)	4/13 (30·7%)
1946	20	0 (0%)	8/21 (38·1%)
1947	32	2 (6·3%)	11/31 (35·5%)
1948	23	5 (21·7%)	10/23 (43·5%)
1949	13	0 (0%)	3/14 (21·4%)
1950	11	0 (0%)	3/10 (30·0%)
1951	9	1 (11·1%)	2/10 (20·0%)
1952	10	1 (10·0%)	5/10 (50·0%)
	402	50 (12·4%)	145/376(38·6%)

The eclamptic convulsion, flashing forth so suddenly and so dramatically, is an event of the greatest importance, and the veriest tyro is at once aware of the fact that he is confronted with an emergency which in a few seconds may place the lives of mother and child in the direst jeopardy. The disciples of Hippocrates in such circumstances are filled with the urge to do something, to do anything, to busy themselves about what they conceive to be their father's business. It is not surprising that persons gifted with stoutness of heart rather than breadth of intellect have occasionally done too much.

Indeed, much of the treatment of eclampsia is more properly described as over-treatment, and it is surprising that so many patients have survived the therapy. This liability of certain eclamptic patients to recover is one of the most important things of which to take account in the critical evaluation of new managements. Eastman (1950) tells us that Whitridge Williams used to meditate upon the consequences which might follow if various obstetrical complications were left quite alone. His speculations inclined him to the belief that in such circumstances a surprising proportion of eclamptic patients would recover. Eastman himself confirmed this as a result of personal experience in China, where he had the opportunity to observe the recovery of patients in circumstances when it was necessary to maintain a strict policy of non-intervention.

* Based on a lecture at the Institute of Obstetrics and Gynaecology, University of London, 12th December, 1953.

It is therefore unnecessary to urge caution in the acceptance of new claims. The journals are cluttered up with reports of individual cases or short series of cases, usually written by persons who are impelled to contribute to an eager world the results of spectacular success in handling their cases. The reporting of failures is less frequently seen, but it is not to be assumed that the occurrence of failures is necessarily infrequent. Furthermore, the mere fact that it is possible to include any one patient in a therapeutic survey means that her disease has been of a type which allowed time for treatment to be organized. This automatically excludes those very severe cases in which a single convulsion is immediately fatal, and such cases are by no means rare. Other factors which require to be taken into account include the powers of resistance of differing populations, chance variations in the severity of the disease, and a tendency (in the United Kingdom at least) for cases to come earlier under the control of the consultant service as a result of the slow improvements in antenatal care.

General Remarks on the Management of Eclampsia

While sedative management in accordance with the principles so clearly enunciated by Stroganoff (1930) holds general pride of place, the detail of his method has been subjected to wide variation in individual centres. Of recent years basal narcotics such as bromethol (avertin) and sodium thiopentone (pentothal) have attracted some attention.

Skilled nursing and the general measures designed to support and protect the unconscious patient remain of paramount importance. The knowledge gained in extended cranial surgery is being applied with good effect to this end.

While treatment by colonic and gastric lavage has largely been abandoned, a whole group of therapies has sprung into vigorous growth as a result of newer theories in regard to the aetiology of eclampsia. The Italian obstetrical societies met at Perugia in 1952, and took the management and prognosis of eclampsia as their main subject of debate. The admirable survey of the field published in the *Minerva Ginaecologica* throws a shrewd light on the present confusion. Liver extracts, cortisone, cholinesterase, histaminase and synthetic anti-histamine drugs, hydration, dehydration, intravenous procain, nicotinic acid, penicillin, are all examined, while in other recent publications in the same journal the theory that eclampsia is related to the occurrence of sunspots has been examined and rejected (Bailo, 1952).

The role of the midwife. Space does not permit the examination in detail of the contribution of the midwife to the care of the eclamptic patient. How large it is is appreciated principally by those who have had to work in parts of the world where such skilled assistance is unobtainable. The most important section of her duties is probably summed up in the words "observation and reporting". From her may be expected the first recognition of renewed restlessness which may presage a further convulsion, the first information about the accumulation of secretions or transudates in the respiratory tree, the latest report on the volume of urine secreted, and the assessment of the general state of the patient as reflected in temperature, pulse and respiration records, together with the skin colour and the secretion of sweat.

The maintenance of the airway. Acute spasm of the glottis during the developed convulsion is hard to combat, except by preventing further fits. Obstruction to the airway attributable to swelling of the tongue and flaccidity of its supporting muscles can usually be adjusted by the simple methods so well known to the anaesthetists of the last generation—turning the head to one side, hooking forward the chin, the occasional use of a pharyngeal airway, and so on. The insertion of an endotracheal catheter may be useful at times, but I have not employed it myself. I believe that in prolonged unconsciousness its presence may be dangerous, while in shorter periods of coma it may be more irritating than comforting to the patient returning to consciousness. The removal of secretions from the buccal cavity or hypopharynx may call for suction with a mucus extractor of the type commonly used in the newborn, possibly with the assistance of postural drainage. The semiprone position may be enough, but there is no objection to placing a patient temporarily in a steep Trendelenburg position when there is much

secretion. It is possible that some deeply unconscious patients may be rescued by bronchoscopic aspiration, though the use of this instrument in eclampsia has not yet been recorded. Collins and his associates (1953) have suggested that there may be a place for tracheotomy in the management of very deep eclamptic coma. I cannot think myself that many lives are saved in patients so desperately ill as to require this expedient, and in less serious cases it may present an added insult to the tortured body. The timely administration of atropine in dosage of 1 mg. (1/60 gr.) is surprisingly successful on occasions in drying up the coarse bubbles heard while standing by the patient's bedside, but is of no value in true pulmonary oedema.

The danger of aspiration pneumonia is very real. The administration of penicillin in intramuscular doses of 250,000 units 8-hourly is probably of some value in its prophylaxis. Some authors have attributed to penicillin a possible direct therapeutic influence on eclampsia and the indefatigable Smith and Smith *et al.* (1952) have actually tried it out from this standpoint with inconclusive results.

While it is probably correct to say that cardiac exhaustion is one of the commonest causes of death in uncontrolled eclamptic convulsions, it is likely that there is little direct assistance which can be offered therapeutically to prevent this disaster. The most useful measure is probably the administration of oxygen to all patients in the immediate post-convulsive phase, and its continuance so long as there is any cyanosis. There is a place for venesection of 500-1,000 ml. in that form of cardiac failure associated with pulmonary oedema and congestion of the systemic venous system. Eastman (1950) believes that all such patients should be digitalized, although it seems doubtful whether this is likely greatly to benefit the rather desperate situation. On the assumption that the patient has previously had no digitalis, a single intravenous dose of digoxin 1·5 mg. may be given. Its maximum effect should be attained in some 2 hours.

The intravenous administration of hypertonic dextrose in distilled water (not saline) appears to be of value as a diuretic in some cases, although it is hard to say what proportion of these would have developed a favourable diuresis had such treatment been withheld. Yet the critical Dieckmann (1952) commenting on the paper by my colleagues Gerrard and Newton (1932) says he believes that the use of hypertonic dextrose has contributed more than any other single factor to such reduction of the maternal mortality rate as has been achieved in recent years. The daily injection of 1 litre of 20 per cent dextrose is generally employed, and in such quantity it is unlikely that the water does much harm. I personally prefer to use smaller quantities of 50 per cent dextrose in dosage of 50-100 ml. every 4 hours, given only to patients who are oliguric, however, and not employed routinely. Fifty per cent dextrose is sticky and all too frequently causes venous thrombosis. Other diuretics are probably contra-indicated.

The general acceptance of dextrose therapy was probably related in part to the belief that it might help to protect the damaged liver from further toxic substances. The use of calcium gluconate in intravenous dosage of 10 ml. of 10 per cent solution is still quite widespread and it may well be given in similar belief. So far I have seen no record of the deliberate use of aminoacids in eclamptic therapy, but, following the interesting communication of Walshe (1953), I would be prepared myself to employ sodium glutamate in intravenous dosage of 23 g. daily in any patient in whom prolonged coma with signs of liver dysfunction supervened upon eclampsia. Dispensing details are recorded by Mayer-Gross and Walker (1949).

Obstetric management. The fact has always been recognized that most cases of eclampsia existing prior to delivery commence to improve very shortly after the expulsion of the child and placenta. This was the basis of the management of eclampsia by Caesarean section which constituted one of the major obstetrical catastrophes of the early twentieth century. Yet it is possible that Caesarean section fell into disrepute somewhat unfairly through its being applied to the wrong cases. Dieckmann (1937) was already prepared to express a conviction, which many others had begun to feel, to the effect that in really severe eclampsia Caesarean section did not add materially to the death rate and that in individual cases its application might indeed be lifesaving. He went on to say that "any pro-

cedure which hastens delivery without any high inherent mortality of its own increases the patient's chances for recovery". With the subsequent improvements in anaesthetic technique and in measures to control the convulsion, this observation is more true than ever. The choice of such procedures must be between the induction of labour and Caesarean section. When Dewar and I (1947) described the use of bromethol as an anti-convulsant we mentioned that it was our practice very shortly after the first dose of bromethol to examine patients vaginally, and to puncture the membranes in those cases where the condition of the cervix seemed to predict a prompt uterine response. Where such response seemed unlikely, we did not hesitate to carry out Caesarean section in cases which seemed to us severe. Others we treated conservatively until the convulsive phase had passed. The fear of precipitating labour in the eclamptic patient need not sway judgment away from intervention, since the new anti-convulsants are so much more effective. In regard to the conduct of labour it is not possible to lay down hard and fast rules. Whether the onset of labour is induced or occurs spontaneously, it is my opinion that the circumstances in which eclampsia *per se* should be taken as an indication for operative vaginal delivery exist only when the cervix is fully dilated and the head or breech is sufficiently low in the pelvis to indicate the probability of an easy extraction. In those circumstances the onset or the recurrence of eclamptic convulsions can be taken as a justifiable indication for operative intervention. The standard purely obstetrical indications continue, but it is dangerous to lay down slavish precepts.

Drugs operating on the Nervous System

(a) *Cortical depressants.* These range from chloroform or ether through the opiates, chloral, paraldehyde and the barbiturates, to avertin or bromethol. The prudence of avoiding chloroform or ether, at least in repeated doses, seems unchallengeable, though their time-honoured use as first-aid measures may still be condoned. Chloral in dosage of 3 g. (45 gr.) to 4 g. (60 gr.) was an essential part of the original Stroganoff regime. Paraldehyde is again in favour in rectal dosage of 40 ml., or by intramuscular injection of 10-20 ml. The optimum dosage seems difficult to determine. The opiates have proved disappointing, often failing to control convulsions in dosage sufficient to produce serious respiratory depression. Their use in combination with chloral was vigorously supported by Stroganoff, however, and it is probably right to say that morphia is used more than any other single drug in the management of eclampsia. Various barbiturates alone or in combination with morphia have been lavishly employed. Sodium phenobarbitone in dosage of 0·3 g. intramuscularly is useful in such circumstances, but the greatest attention in recent years has been concentrated on the use of sodium thiopentone in continuous intravenous drip as originally proposed by the late O'Donel Browne (1950). This treatment is so important that it will be discussed in detail later, as will also the management with bromethol or avertin.

(b) *Osmotic cerebral decompressants.* Various hypertonic solutions of ionizable substances and crystalloids have been advised in the belief that some portion of their action might result in osmotic cerebral decompression. The parenteral use of concentrated solution of magnesium sulphate, prescribed also with intent to apply its action as a cerebral depressant and a general vasodilator, is a case in point. Opinions differ about dosage. The intramuscular route is usually chosen. The strength generally recommended is a 50 per cent solution and the dosage varies between 10 ml. and 20 ml. for the initial dose, with rather smaller doses to be repeated after each convulsion. Eastman (1950) is prepared to give as much as 40 g. (80 ml.) in the first 24 hours (so long as the knee jerks remain active) but most authorities favour a somewhat more cautious dosage. Hypertonic dextrose is employed for reasons which may well be linked with the basic concept of osmotic decompression.

(c) *Spinal blockade.* Whether introduced by intrathecal or epidural injection, this technique for lowering blood pressure has recently received much favourable comment in international literature. Paramore (1930) advised spinal anaesthesia many years ago, but the method has acquired enthusiastic support from the chance observation that eclamptic patients did well

when anaesthetized with continuous caudal analgesia (Lull and Hingson, 1945; Lund, 1951; Jones *et al.*, 1952).

(d) *Ganglioplegic drugs.* Penny and Shackleton (1951) reported a single case in which eclampsia uncontrollable by barbiturates and chloroform subsided completely following the cautious administration over a period of 12 minutes of 60 mg. hexamethonium bromide. Favourable confirmatory reports have since appeared in French and Italian journals, and mention is made of another case by Campbell and Burton (1952).

In regard to both spinal anaesthesia and hexamethonium compounds, it must be pointed out that those with considerable experience of eclampsia have seen numerous cases in which fits persisted where the brachial blood pressure was at or below normal levels. It is therefore important not to expect too much from such lines of treatment.

(e) *Other sympatheticolytic drugs.* The theory that eclampsia represents a condition to which sympathetic over-action is strongly contributory has prompted a search for specific antisympathetic drugs. Of these, procain hydrochloride has been reported as effective in the treatment of eclampsia, given intravenously in dosage of 10 ml. of 1 per cent solution (Ezes, 1948).

(f) *Curarizing agents.* Curare and its synthetic analogues have been used, but no large series has yet been published. It may be that some of the reputation of magnesium sulphate in eclampsia may be attributable to its curare-like action.

(g) *Veratrum derivatives.* Enthusiasm for the use of these appears to have revived in the United States. The maternal mortality figures reported by the Cincinnati School over the last 19 years are astoundingly good (Garber *et al.*, 1950). The precise mode of action remains uncertain, but McCall (1953) suggests that a more or less specific effect on cerebral blood flow may be responsible. "Veratrone" (Parke, Davis & Co.) remains the standard preparation, the usual intramuscular dose being 0·2 ml. Assali (1950) has worked out a technique for intravenous administration of 0·2 ml. per hour in dilution with 5 per cent dextrose. The uncomfortable side actions have not yet been overcome.

The Basal Narcotics in Eclampsia

General. Although Stroganoff's contribution (1930) to the management of eclampsia was massive and enduring it has been generally felt that some more effective regime should be sought. Stroganoff and Davidovitch (1937) discussed the substitution of parenteral magnesium sulphate for chloral, but the results still left something to be desired. In 1947 Dewar and I described the use of bromethol (avertin) as the sole sedative. About the time our paper appeared O'Donel Browne had commenced his work on the control of eclampsia with continuous sodium thiopentone, and in 1950 he made a preliminary report of his first 18 cases. Campbell and Burton (1952) reviewed the uses of the basal narcotics in eclampsia, showing some preference for avertin, and Krishna Menon (1953) has recently published his results with the use of thiopentone.

Sodium thiopentone. O'Donel Browne's paper (1950) was not the first reference to thiopentone in the control of eclampsia. Fraser and Stringer (1950) had described its use, and Dewar and I (1947) referred to 1 case in which we had used sodium thiopentone in the first-aid treatment of a very restless eclamptic prior to continuing sedation by other means. Browne's attempt to maintain treatment with thiopentone alone, and with its aid to keep the patient free of fits for as long a period as 24 hours, represented a major change in the management of eclampsia, and I propose now to describe the pentothal management in some detail.

Browne's practical instructions included the suggestion that, if the patient developed eclampsia in her own home, she should be given morphia prior to her transport to hospital. If in hospital treatment with pentothal should be commenced at once. He deprecated the use of thiopentone or avertin in the patient's home, believing that the resultant narcosis would be inconveniently deep during transport.

The initial dose of sodium thiopentone should be given intravenously with a syringe, injecting fairly quickly so as to bring the patient rapidly under the control of the drug. The standard dosage was 0·5 g. in 10 ml. distilled water, but if the patient had had morphia the dosage was decreased to 0·25 g.

The solution for pentothal drip was then dispensed. Three grammes sodium thiopentone was added to 1 litre of 10 per cent dextrose in distilled water (not dextrose saline). Browne was willing to substitute 5 per cent dextrose if crystallization occurred when pentothal was added to the 10 per cent solution.

Thereafter the intravenous drip was set up in the usual manner, Browne's intention being to deliver 1 litre in 24 hours. With his own apparatus this result was achieved with a delivery rate of approximately 15 drops per minute. That figure may not be universally applicable.

Browne did not rely upon the drip to maintain complete quiet and tranquillity in all circumstances. Indeed he advised that the patients be under the continuous supervision of a medical officer, and that, at the slightest sign of restlessness, whether due to the pains of labour or other cause, the patient should be wafted back to somnolence by the injection into the drip tubing of supplementary syringe-administered doses of 0·1 g. thiopentone, i.e., 2 ml. of the dilution commonly employed.

In his first series of 18 cases (Fig. 1) Browne employed a total daily dosage of thiopentone varying between 3·2 and 7·9 g. In only 1 case in this series was morphia omitted. His maternal mortality was limited to 1 patient, i.e., 5·5 per cent. There were 6 foetal deaths, i.e., 30 per cent mortality. Four patients out of the 18, i.e., 22·2 per cent, experienced recurrence of convulsions following the commencemrent of treatment. These were all in the early part of the series, and with his later experience Browne considered that the dosage of pentothal had been inadequate.

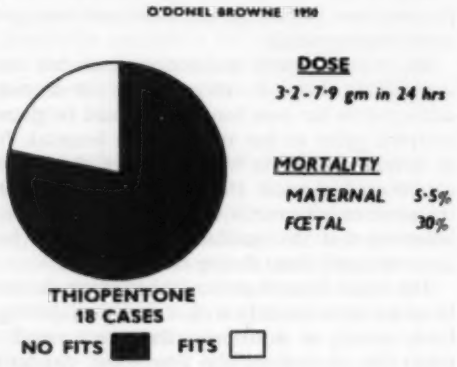

FIG. 1

Summary of O'Donel Browne's initial report (1950 Recurrent fits illustrated diagrammatically.

We must all mourn very deeply the fact that O'Donel Browne is no longer in our midst. No doubt further publication from his fluent pen would have appeared in continuation of his preliminary report. A reference to the Rotunda Hospital report for 1950-51, the only one that he published subsequent to his paper in 1950, reveals that he had at that time brought his total of cases treated up to 26. He was prepared to give as much pentothal as 10 g. in 24 hours. The maternal mortality (2 deaths) stood at 7·6 per cent. The general incidence of recurring fits had been reduced to 13·5 per cent in the 24 cases for which full details are available. The total foetal mortality was 8 (33 per cent).

Krishna Menon (1953) has now presented a further report on the thiopentone management. During 7 calendar months of 1951-52 he treated 75 cases following Browne's technique punctiliously. The results were most interesting in that, while the number of cases showing recurrent fits was reduced from 47 per cent to 9·5 per cent, the figures for maternal mortality did not differ greatly from the mean figure over the previous 12 years. Krishna Menon's comment on the thiopentone treatment may be summed up in his own words: "While pentothal may perhaps be the best drug in the control of the convulsions, in my series of cases it has not helped in any way to bring down maternal mortality. . . . I must mention here what a strain it is to the medical staff undertaking this line of treatment. The constant careful attention which is the essence of this method gives a very anxious time to the doctor and I am constrained to admit that from my experience the results have not been commensurate with the stress and strain gone through."

Although Krishna Menon has ceased to use thiopentone, the method may still offer very great advantages in a community where eclampsia is a less frequent problem than it is in Madras.

Bromethol. Dewar of Dumfries was at one

time Clinical Tutor to Dr. Douglas Miller in the Royal Infirmary in Edinburgh. At that time Dr. Miller's anaesthetist, following a practice introduced by Professor James Young some years previously, was using premedication with avertin for most elective gynaecological procedures. Dewar was impressed with the smoothness of the induction of basal narcosis, and about 1942 began to use avertin as a sedative in cases of eclampsia. He introduced me to the method in 1943, and we used the technique as the treatment of choice in 44 eclamptics, constantly exchanging information, and modifying our management as experience grew. Dewar's initial decision in respect to dosage was to employ the arithmetical mean between the dosage recommended by the manufacturers respectively for basal anaesthesia and for "obstetrical twilight sleep". This works out at 0·0875 ml. of concentrated bromethol solution per Kg. of body weight, and initially we regarded it as necessary to be rather precise in regard to weight and dosage. It rapidly transpired, however, that the patients tolerated the medication extremely well, and that toxic effects were conspicuous by their absence. We therefore agreed quite early that we should be quite precise about the weight in all patients who were admitted to hospital prior to the onset of eclampsia, but that, in respect of patients admitted in the course of the disease, we would be prepared to make a rough estimate of weight to the nearest stone, and base the dosage on this estimate, making no attempt to correct the dosage in respect to the weight of the child and its placenta.

I now agree with the suggestion of Campbell and Burton (1952) that the dose for a 10 stone (63 Kg.) patient (5·5 ml. bromethol in 223 ml. of water) should be regarded as a dose for the average patient and entirely suitable for use in her own home prior to her removal to hospital, always provided she makes the journey under close medical supervision. The dispensing details are straightforward. The quantity of concentrated solution is conveniently measured with a syringe, and is then diluted with tap water at 40° C. There is no need for great precision in respect of temperature. The human hand may be substituted for the thermometer. It is only prudent, however, to use the Congo red test recommended by the makers to determine the absence of acid degradation products resulting from overheating.

The rectal administration of the bromethol is very simple. The injection is of small bulk, and despite the restlessness of the eclamptic patient difficulties are rare provided the patient's head is kept low. Excessive cooling of the enema should be avoided. The use of a Thermos type container is valuable and particularly so if the injection is to be taken from hospital to the patient's own home.

After withdrawal of the rectal catheter a patient will sometimes expel a small quantity of the fluid, recognized by its characteristic odour. Such loss can usually be neglected. If, however, the patient should return a large quantity of the enema within 10-15 minutes of the injection, it has been found useful to repeat the injection at once, but using only half the dose, so as to ensure against over-dosage.

For the patient who is very restless indeed, we believe there is an admirable field for the combination of pentothal and avertin, the patient being brought quickly under control by a single injection of pentothal, of which 0·25 g. will usually suffice, the avertin being given rectally before she recovers from the effects of the pentothal. Macintosh (1952) makes it quite clear that he regards the use of pentothal as admirable first-aid management, though he does not commit himself in regard to further measures to control the fits.

By 1944 Dewar and I had come to recognize, first, that a single dose was insufficient to prevent recurring convulsions in a severe case, and second, that we were perfectly safe to repeat doses as soon as the patient began to show signs of restlessness. We had learned to aim at a period of complete sedation for 24 hours, but, in the severest cases, we extended that sedation up to 48 hours or slightly more. In general, we were quite prepared to give a second dose some 3 hours after the first. After 2 such doses, we found the patients usually slept for periods up to 12 hours before requiring a third. The administration of more than 3 doses in 24 hours was seldom called for but the details of a few such cases are quoted in our paper in 1947.

We have seen no clinical evidence of liver

damage, while it has not been possible to attribute oliguria to the action of the drug in any of our cases. Indeed, many of them have shown quite striking diuresis in the first 24 hours after starting treatment, although we have given no fluids whatever by the mouth during this first 24 hours. We have therefore felt fairly confident that any harmful effect on urinary secretion is unimportant in the human subject in the doses that we have employed, while Brown *et al.* (1950) have shown that in normal pregnant patients avertin actually causes diuresis.

At the same time, we are cautious in administering repeated doses to seriously oliguric patients, lest cumulative effects develop.

We treated 44 patients, who were delivered of 49 babies and 2 abortions. Two mothers died (i.e., 4·5 per cent). There were 7 stillbirths and 8 neonatal deaths, i.e., 30·6 per cent. These figures compare very favourably with our previous experience in 1939-43. In exactly double the number of patients, the maternal mortality was 20·5 per cent and the foetal mortality 41·5 per cent.

The most impressive feature of management with avertin was in our opinion the striking reduction in the incidence of recurring fits (Fig. 2). Prior to the introduction of bromethol, we observed recurring fits in 59·3 per cent of our 88 cases. In the bromethol series 6·8 per cent of our 44 patients continued to have seizures. The above findings are even more strikingly demonstrated when the number of recurrent fits per patient is considered (Fig. 3). This we show graphically in a diagram from which it is obvious that those patients who experienced recurrent fits after bromethol had far fewer than the patients we treated by other sedatives.

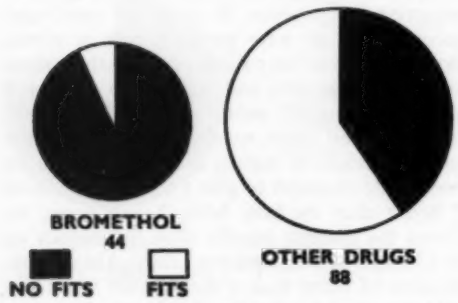

FIG. 2

Comparative incidence of recurrent fits (Dewar and Morris, 1947).

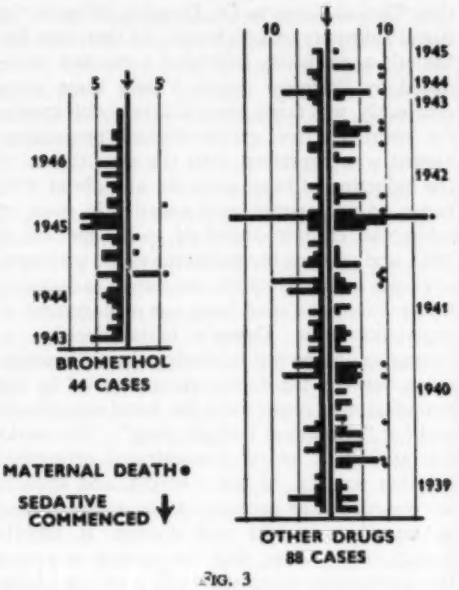

FIG. 3

Number of fits per case (Dewar and Morris, 1947). Vertical line illustrated by arrow indicates commencement of treatment. Horizontal lines indicate number of fits.

In fact, Dewar and I came to the conclusion in 1946, that we had developed a form of treatment which gave good hope of improving the control of eclamptic seizures. We emphasized that we did not feel justified in claiming that management with avertin would yield mortality figures greatly differing from those in patients successfully controlled by other methods. This was a fairly cautious conclusion, and it may be that it was over cautious, but it is interesting to compare it with Krishna Menon's assessment of thiopentone. In the years since 1947, I have had comparatively few cases of eclampsia under my personal care, but Dewar has kindly supplied me with his latest figures. In 39 cases since 1947 his maternal mortality (1 case) is 2·5 per cent, his foetal death rate at 15·7 per cent is extremely satisfactory, while the index of recurrent fits is

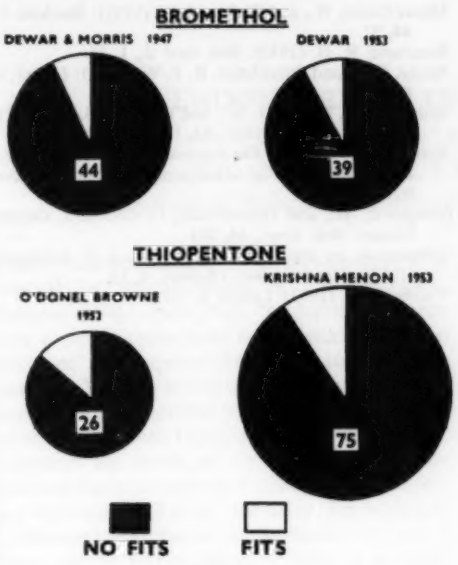

FIG. 4

Comparative incidence of recurrent fits. Numerals refer to number of patients reported.

7·7 per cent, not greatly different from the figures of 6·8 per cent which we originally noted.

COMPARISONS

It may be useful now to glance at the comparative figures for the bromethol and thiopentone series. There is a very striking similarity about the index of recurrence in the four major groups of cases (Fig. 4). I believe that in bromethol and in continuous sodium thiopentone there are available two forms of management of the eclamptic which offer better hope of controlling the convulsions than any others heretofore presented, that both forms of management require extremely careful and painstaking supervision, but that in the case of bromethol rather more of that supervision can be delegated to the midwife. Bromethol has proved in field trials as quite suitable during a medically accompanied journey by road, and on at least one occasion by air ambulance from the Outer Hebrides to Glasgow. Its use in air transport in Canada has recently been described by Frew (1953). Thiopentone has certain advantages in bringing the patient more quickly and certainly under control. Bromethol has the disadvantage that, like all forms of rectal medication, it may become messy. Continuous thiopentone has the very minor disadvantage that it may be difficult to maintain the drip at the required rate with certainty, especially if the patient turns restless rather suddenly.

The choice between these agents must remain largely personal. I am very satisfied with bromethol.

ACKNOWLEDGMENTS

I have to thank the Chairman and Members of the Medical Committee at St. Mary's Hospitals, Manchester, for permission to use the hospital records, and to quote from them. I am indebted to Professor Krishna Menon for a long and most interesting personal letter dealing with his results and future intentions. Dr. J. Bruce Dewar of Dumfries has supplied much information, while the illustrations are the work of Dr. Robert Ollerenshaw, of the Department of Medical Illustration, in the United Manchester Hospitals.

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ENDOMETRIOSIS OF EPISIOTOMY SCAR

BY

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WHILE endometriosis is relatively common it is unusual to find deposits in the perineum. McLeod (1946) states that "probably not more than a dozen cases have been described in the literature". Törnqvist (1949) collected from the literature 35 cases of vulval, vaginal and perineal deposits, and described 2 additional cases, one following perineal rupture and the other after operation for prolapse. In his series 9 cases followed perineal rupture, 7 after perineorrhaphy and episiotomy, 7 after operation for prolapse, 6 following extirpation of Bartholin's gland, 6 after vaginal hysterectomy, 1 after a perineal incision for vaginismus and 1 where the patient had a vaginal injury the result of douching.

Schmitz and Grossbard (1948) reported a case which they believed was the first recorded following a spontaneous delivery. In their case the patient was operated on 4 years after a normal delivery with an episiotomy but is stated to have had symptoms from 4 to 5 months after delivery.

Törnqvist states that the interval between the primary operation or laceration and the onset of the earliest symptoms was less than 2 years in 22 of the 37 cases, the shortest interval being 4 weeks and the longest 16 years.

In some of the recorded cases (Brougher, 1947; Törnqvist, 1949) the perineal swelling is described as being of bluish colour, but in others there was a hard swelling with no discoloration in the region of the perineal scar. The subjective symptoms are similar in most of the reports, namely, an ill-defined swelling which gradually increases in size, and which usually causes a feeling of discomfort and distension in the perineum at the menstrual period and is frequently associated with dyspareunia.

The following case is presented on account of its rarity:

Mrs. C., aet. 27 (1949), had been married 3½ years. She had a spontaneous full-time delivery in March, 1947. At this delivery a medio-lateral episiotomy was performed. In February, 1949, the patient was seen complaining of a "lump at the side of the passage" since the birth of the baby. She was very definite in stating that the lump had been present in the puerperium, had gradually increased in size and was at that time painful at her menstrual periods. Dyspareunia was present if coitus took place during the week following menstruation. On examination there was a tumour in the region of the right medio-lateral episiotomy. It was tender on palpation, irregular with an ill-defined outline and was about 1 inch in diameter.

At operation on 15th September, 1949, the perineal swelling was dissected out with difficulty as it extended upwards along the right side of the vagina. During the dissection small cystic areas containing altered blood were opened suggesting the probable diagnosis of a perineal endometrioma.

The pathologist's report on the specimen was as follows: "The tissue is typical endometrium in the secretory phase of the cycle and is accompanied by pigment-containing macrophages and some effused blood."

Her last menstrual period had commenced on the 18th August, 1949, and hence the menstrual phase of the ectopic endometrium corresponded with the corpus luteum phase of the ovarian cycle (see Figs. 1 and 2).

The patient was subsequently seen on 1st May, 1951. She had not become pregnant in the interval although contraceptives had not been used. There was still a small nodule about the size of a lentil deep to the operation and episiotomy scar. She stated that it was uncomfortable at her menstrual period and, as before, she had dyspareunia related to the week following menstruation.

She was anxious to have another baby and in view of this a hysterosalpingography under anaesthesia was carried out. Pelvic examination showed no clinical evidence of pelvic endometriosis, and the report on the hysterosalpingogram read as follows: "The uterine cavity is normal in size and shape. Lipiodol has passed along the left tube but not the right. At 24 hours there is a little lipiodol in the peritoneal cavity on both sides, but there is no free spill suggesting that patency is not normal."

It has been suggested that endometriosis can be demonstrated by hysterosalpingography, but there was no evidence of uterine endometriosis in the X-ray picture in this case.

While infertility is a well recognized feature of cases of endometriosis it is strange that it should be associated with an apparently solitary perineal deposit. In the case of Schmitz and Grossbard the patient (aged 23) was infertile for 4 years, in one of Törnqvist's cases (aged 34) she had not been pregnant for 7 years, and in the case now recorded infertility was a complaint, her baby being 4½ years old.

The patient was seen again in December, 1951, and the small nodule at the apex of the operation scar was still present. Infertility was still a complaint. Having heard a discussion in Boston in October, 1951, on the use of androgens in cases of endometriosis in young women, and in view of Hirst's account in 1943, we decided to try the effect of such therapy.

It has been stated that an appropriate dosage of androgens exerts two effects acting concurrently, namely, a central inhibitory one upon the hormone functions of the pituitary and ovaries, and a peripheral neutralizing effect on the circulating oestrogens. It is suggested that this "damping down" causes diminution in the size of the endometrial deposit and improves the patient's chances of becoming pregnant. Provided the dosage is kept below 500 mg. of testosterone proprionate per month the incidence of virilizing symptoms is low.

From early December, 1951, the patient was treated with 10 mg. methyl testosterone daily in the form of sublingual pellets, with instructions to report in 3 months. When seen on 29th April, 1952, she stated that she had noticed a distinct improvement. The menstrual discomfort and dyspareunia, of which she previously complained, had disappeared. Her general condition was much improved and the only alteration noted by the patient was a slight diminution in the menstrual loss. On vaginal examination the swelling felt in December, 1951, had resolved and the area in which it had been situated was no longer tender. Treatment with testosterone was discontinued following this examination.

The patient was next seen on 15th July, 1952, and at this time she had 7-weeks amenorrhoea, her last period having occurred on 25th May, 1952. She was obviously pregnant and there was no evidence of an endometrial deposit in the vagina. On 3rd March, 1953, she had a spontaneous delivery of a full-time female infant without a perineal laceration.

At postnatal examination the pelvic floor was normal with no evidence of an endometrioma. The uterus was involuted and the cervix healthy.

Javert (1951) has suggested that the spread of benign endometrium is essentially similar to that of endometrial carcinoma, namely, by direct extension, exfoliation and implantation of endometrial cells at menstruation, lymphatic spread and haematogenous metastases to distant organs. The deposit described has probably resulted from implantation in the fresh perineal wound.

There is no record of a second perineal deposit having occurred following a subsequent confinement or of the effect of a subsequent pregnancy on any existing perineal endometriosis.

This case is interesting in that the onset of her symptoms dates from the puerperium, a stage when discomfort in a perineal scar might be accounted for by infection or a retained suture. There was no alteration in the appearance of the skin covering the tumour, nor, as described in other recorded cases, bleeding from the tumour coincident with the menstrual cycle.

It has provided a visual, palpable and clinical demonstration of the therapeutic effect of testosterone on an endometrioma. This method of treatment has also been used in a young unmarried patient aged 24 with a recurrent endometrioma in the right utero-sacral ligament. In this case the treatment with testosterone appears to have had little effect and therefore makes one sceptical of the apparent value in the case recorded.

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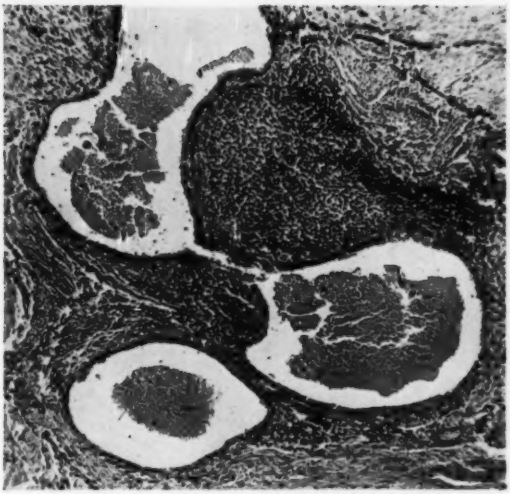

FIG. 1

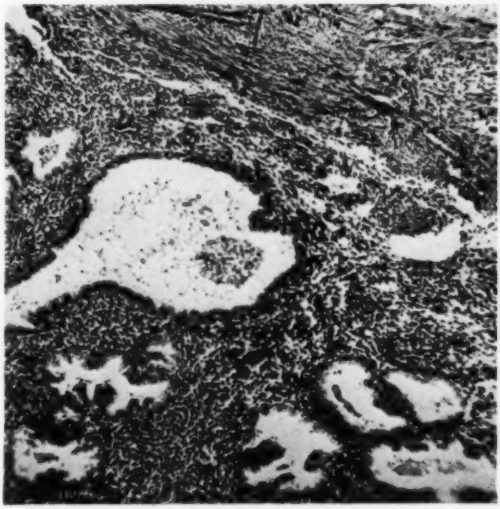

FIG. 2

TUBAL PREGNANCY IN TUBERCULOUS SALPINGITIS*

Report of a Case with Histochemical Analysis of Crystalline Inclusions

BY

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THE first complete account of coincidental tuberculous salpingitis and tubal pregnancy given by Stevenson and Wharton (1939) analyzed the 8 cases that had been reported in the world literature and added another case.

Bland (1940) found a total of 32 cases and different authors have reviewed the subject and added cases of their own (Røjel, 1941; Hicks, 1942; Shannon and Heller, 1943; Mann and Meranze, 1944; Pink, 1944; Haifetz, 1947, Geisendorf, 1950; Fitzgibbon and Widdes, 1951).

The case herein described is believed to be the first to be published in the English literature and the 44th case to be reported.

CASE REPORT

Mrs. J.J., aged 34 years, was admitted to hospital on 19th October, 1952. Her menstrual cycle had always been regular. Menarche had occurred at 16 years of age. The periods lasted 5 days recurring at 28-day intervals. Her last menstrual period was on 7th September, 1952, and the next period was, therefore, 2 weeks overdue. There was a 2-week history of continuous lower abdominal pain worse for the 5 days before admission. There was some nausea but no vomiting. The bowels were costive and there was severe pain on defaecation. There was some increased frequency of micturition. Her breasts were not enlarged or painful. There was a thick offensive vaginal discharge.

Appendicectomy in 1935 was the only illness in the past. There had been no pregnancies in 12 years of married life. Infertility investigations in 1947 had included insufflation of the Fallopian tubes and lipiodol hysterosalpingogram. The tubes were patent and there was no other abnormality.

When examined she was a pale woman in some pain. The temperature was 99·4° F. and pulse 76. The abdomen was tender with guarding in both iliac fossae. Vaginal examination was inconclusive. The uterus was bulky, anteverted and firm. Moving the cervix produced pain. There were no obvious pelvic masses but she was tender in the fornices. A blood count showed haemoglobin 84 per cent (12·4 g.), red cells 4·18 mil. A white cell count was 17,600 with 90 per cent polymorphs. The diagnosis lay between a salpingitis and a "leaking" ectopic gestation. Penicillin therapy was commenced.

On 24th October, 1952, the pain was still present but less intense. The temperature had been normal for 4 days. She began to bleed per vaginam that day but the loss was almost black and not heavy. Blood count showed haemoglobin 67 per cent (9·9 g.) and the Aschheim-Zondek test was positive.

On 24th October, 1952, examination under anaesthesia revealed a rounded mass to the right of a bulky uterus and a soft cystic swelling in the Pouch of Douglas.

At laparotomy, a right peritubal haematocoele containing chorionic tissue was found together with a pelvic haematocoele of old and fresh blood. There were several small uterine fibromyomata. The other appendages were apparently normal. Right salpingectomy and multiple myomectomy were performed.

The patient's postoperative course was uneventful apart from the passage of a uterine cast on the 5th postoperative day. She was discharged on 12th November, 1952.

PATHOLOGICAL EXAMINATION

Gross Appearance

The specimen consisted of an oedematous Fallopian tube, at the fimbrial end of which was a mass of blood clot and chorionic tissue.

* Case presented to Section of Obstetrics and Gynaecology, Royal Society of Medicine, 22nd May 1953.

Microscopical Appearance

Chorionic tissue was infiltrating the tube from the outside, whilst the mucosa was adenomatous in pattern and showed active tuberculosis (Fig. 1). There were many typical follicles with tuberculous giant cells and endothelial cell proliferation. There was no caseation and no tubercle bacilli were found. Occasional giant cells were of foreign body type, being bizarre in shape, with numerous, atypically arranged nuclei. Many giant cells contained round, concentrically laminated Schaumann bodies, while a larger number contained crystals (Fig. 2). Occasional crystals were inside disrupted Schaumann bodies. The crystals were irregularly shaped, being rectangular or triangular splinters or conchoidal fragments. While inconspicuous by transmitted light, they were brilliantly shown by phase-contrast illumination (Figs. 3 and 4). Examination by polarized light showed them to be doubly refractile. No lipid could be shown in the crystals, even when Sudan Black was used at 60° C. for 24 hours. Although lipids may often be demonstrated by this means in formalin-fixed, paraffin-wax embedded material, a negative result cannot exclude the presence of lipid in the original tissue. Millon's reaction did not colour the crystals, suggesting that they contained no protein. As noted by Potts (1951), the crystals dissolved in normal hydrochloric acid within 30 minutes, thus proving their non-siliceous nature. The presence of calcium was shown by the formation of gypsum crystals on the addition of 5 per cent sulphuric acid (Pearse, 1953).

Von Kossa's test totally blackened the crystals, demonstrating the presence of carbonate or phosphate. This was confirmed by placing sections in a saturated solution of carbon dioxide in water, in which the crystals dissolved within 24 hours.

The molybdate test for phosphates (Serra and Queiroz Lopes, 1945) was negative.

The conclusion was, therefore, that the crystals were largely composed of calcium carbonate.

The crystals contained small quantities of ferric iron, as shown by a positive prussian blue reaction, by staining with phthalocyanin dyes such as Alcian blue (Pearse, 1953) and by a blue-purple colouration with alizarin. Crystals may be found in the granulomas of sarcoidosis (Engle, 1951; 1953) and regional ileitis. It is possible that their chemical nature varies in different diseases.

A further search was made for confirmatory evidence of genital tuberculosis. The investigations included microscopic examination of the uterine cast and endometrial curettings, endometrial and lochial culture and inoculation into guinea-pigs. These were negative for tuberculosis.

A chest X-ray examination, culture of laryngeal swabs, microscopic examinations, culture and inoculation into a guinea-pig of a 24-hour specimen of urine were also negative for tuberculosis.

The erythrocyte sedimentation rate was estimated at weekly intervals and the rate did not rise above 7 mm. per hour. However, the Mantoux test was strongly positive at dilutions of 1 in 10,000.

In view of these findings, she was re-admitted on 1st December, 1952, for further investigations and treatment. Treatment was commenced on 7th December, 1952. Streptomycin, 0·5 g. 12-hourly, was given in combination with para-aminosalicylic acid, 4 g., 6-hourly. An allergic reaction to the P.A.S. occurred on the 18th day of treatment and the drug was discontinued. When the treatment was complete on 22nd January, 1953, 40 g. of streptomycin and 288 g. of P.A.S. had been given. When seen 2 months later she had no complaints. Two normal menstrual periods had occurred. There were no abnormal physical findings.

Discussion

In view of the history of an appendicectomy and a lipiodol salpingogram in this case, the diagnosis of the granuloma rests between tuberculosis, lipiodol granuloma and talc granuloma.

The presence of lipiodol is shown either by the appearance of masses of this substance in the tissues, or of spaces from which it has been dissolved during routine histological preparation. The absence of this appearance excludes a diagnosis of lipiodol granuloma.

Roberts (1947) suggested that talc granuloma could be distinguished from tuberculous salpingitis by the findings of birefringent crystals. Potts (1951) found birefringent crystals in unequivocal cases of tuberculous salpingitis and proved their non-siliceous nature by dissolving them in dilute acids. That this was possible in this case excluded a diagnosis of talc granuloma.

A diagnosis of tuberculosis is favoured by the characteristic histological picture including the presence of Schaumann bodies, and clinically by the strongly positive Mantoux test.

Burne (1953) found Schaumann bodies in 12 out of 41 cases of tuberculous salpingitis and in only 1 of 100 controls. He concluded that their presence was evidence of tuberculosis, even in the absence of a characteristic histological picture.

It is generally held that genital tuberculosis is secondary to tuberculosis elsewhere, but in most cases, as in this one, a primary site cannot be found.

Tubercle bacilli are notoriously difficult to demonstrate in tuberculous salpingitis and failure to find them here is not a strong point against this diagnosis.

The rarity of tubal pregnancy in tuberculous salpingitis is said to be due to:

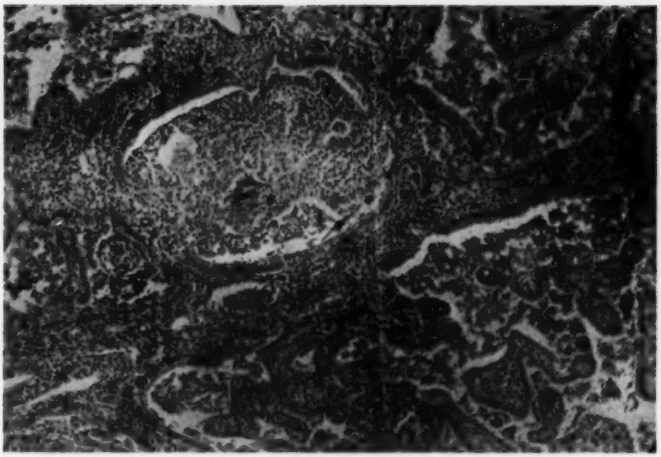

FIG. 1

Tubal mucosa, showing an adenomatous pattern and tubercle-formation. (H. & E. ×180.)

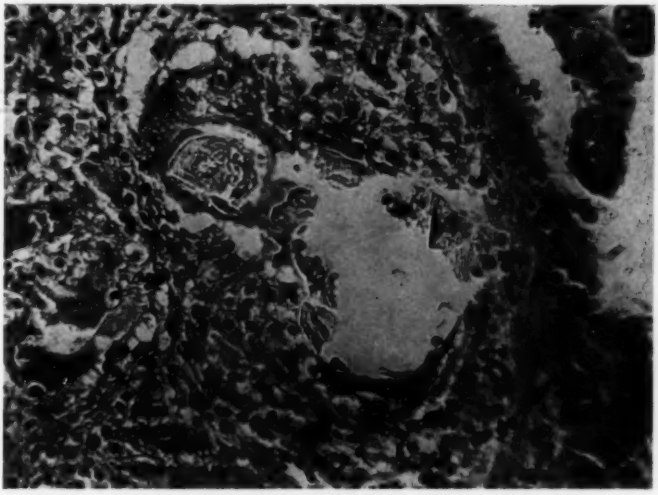

FIG. 2

A disrupted Schaumann body containing splintered crystals. The crystals are inconspicuous when viewed by transmitted light. (H. & E. ×810.)

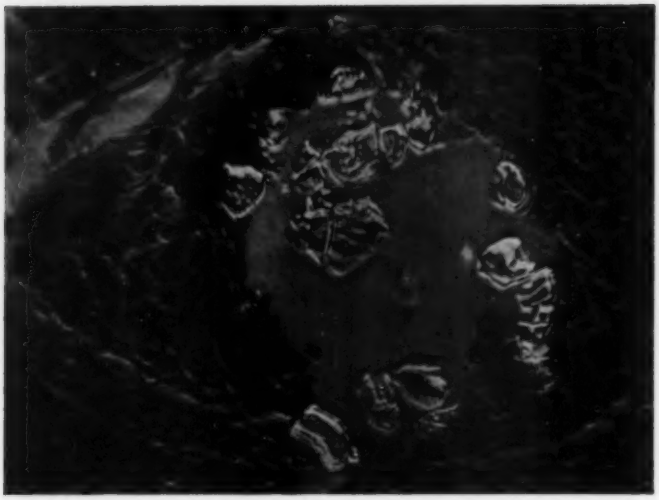

FIG. 3

Conchoidal crystal fragments in a multinucleate giant-cell. (H. & E. Phase-contrast illumination. ×1080.)

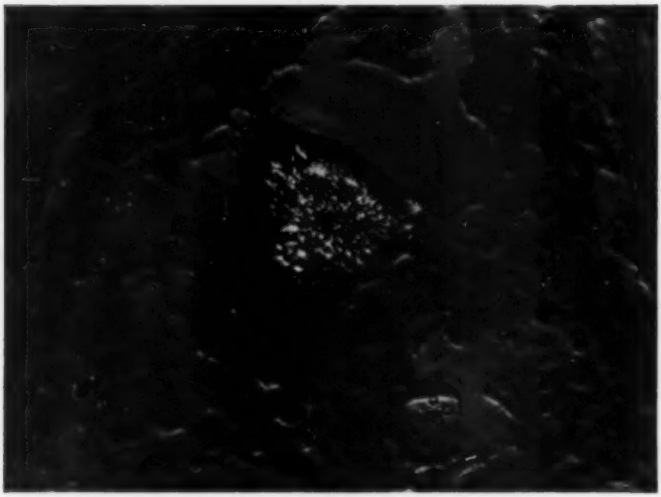

FIG. 4

A crystalline mass inside a multinucleate giant-cell. (H. & E. Phase-contrast illumination. ×1080.)

(1) Obstruction of the tube to the passage of sperms and ova;

(2) Lack of nutrition from the diseased mucosa of the tube (Wharton and Stevenson, 1939; Bland, 1940; Kistner, Hertig and Rock, 1951).

Partial obliteration of the tube may allow the sperm (diameter 2·5μ-3·5μ) to reach the ovum (diameter 120μ) without allowing the fertilized ovum to pass down the tube. This would explain the greater frequency of ovarian or fimbrial pregnancies in the cases reported.

Summary

(1) A case of tubal pregnancy in tuberculous salpingitis is presented.

(2) This finding emphasizes the necessity for routine histological examination of all tissues removed at operation.

(3) Crystalline inclusions were found and histochemical analysis showed them to consist of calcium carbonate.

(4) The presence of Schaumann bodies is strongly indicative of tuberculous salpingitis, even in the absence of a characteristic histological picture.

We wish to thank Mr. R. M. Millen for permission to publish this case, Mr. S. Day for his technical assistance and Mr. H. Knight for the photographs.

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PRIMARY INFERTILITY AFFECTING THREE BROTHERS AND ONE SISTER

BY

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IN a study of 338 couples examined at infertility clinics in Aberdeen and Newcastle-upon-Tyne, on one occasion only has there been evidence to suggest an inherited form of infertility; the details of the family are as follows.

Clinical Details. Mr. M., aged 47 years, a wine and spirit merchant, was referred to the infertility clinic in October, 1946. He had been married twice and neither wife had conceived; the first marriage lasted 10 years and at the time of examination he had been married for 3 years to his second wife. An examination of the second wife had shown no cause for her failure to conceive.

Family History. The patient had three brothers and one sister and although two of the brothers and the sister had been married for many years, no pregnancy had occurred in any of the marriages.

His first brother had been married for 20 years. His second brother had been married twice; the first marriage lasted for 4 years and the second for 5 years. His third brother was unmarried. His sister had been married for 9 years.

Past Medical History. As a child Mr. M. had suffered from measles and one or two other minor childhood ailments. In adult life he had had no illness of note; there was no history of mumps orchitis or venereal disease. So far as could be ascertained he had not suffered from any condition known to depress fertility.

Marital Record. Mr. M. affirmed that sex relations had been normal in both his marriages. He had always been eager to have children and no contraceptive measures had been used in either marriage.

Physical Examination. The patient was a small, tubby man, height 5 feet 2 inches, weight 147 pounds. He was well nourished and looked healthy but secondary sex characteristics were poorly developed. No site of infection was discovered on examination. The penis was small and, although both testes were in the scrotum and of normal size, they were soft.

Semen Analysis. Repeated analyses were made over a period of 2 years and azoöspermia was found on all occasions. Semen specimens were obtained from both the patient's married brothers and they also showed azoöspermia.

Testicular Biopsy. A testicular biopsy was taken from Mr. M. and the pathological report was as follows:

"There is no evidence of fibrosis in the testicle or of changes in the interstitial cells. The tubules are of good size but only cells of Sertoli and spermatogonia are present. No spermatids or spermatozoa are to be seen."

A photograph of the testicular biopsy is shown in Fig. 1. The germinal epithelium in this patient was represented by a number of the most primitive sex cells (spermatogonia).

DISCUSSION

There is clear evidence of the importance of heredity as a cause of infertility in animals. Erikkson (1943) made an extensive study of testicular and ovarian hypoplasia (Swedish hypoplasia) in cattle and in his monograph showed how hypoplasia of the gonads was caused by a recessive gene and the origin was traced back to two affected bulls in Jutland in 1900. By extensive breeding of these bulls and their offspring the condition was spread widely in Sweden and by 1935 the incidence of hypo-

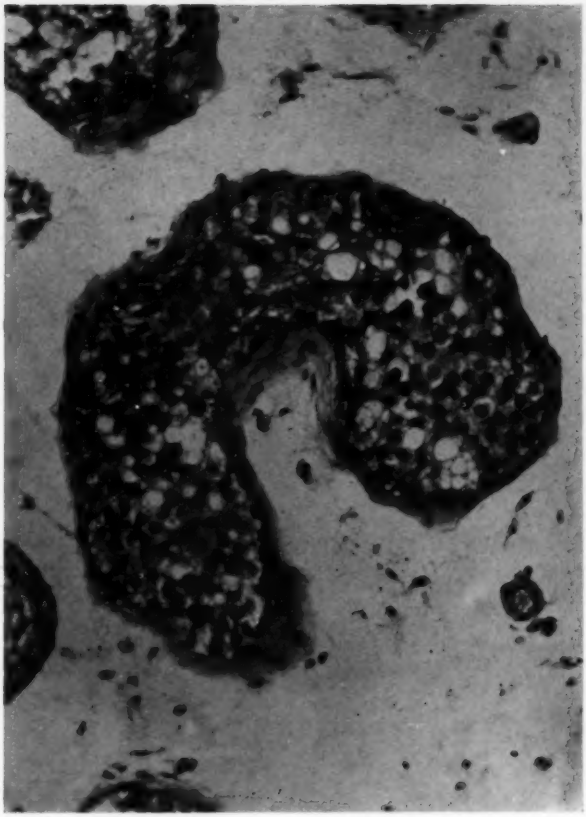

FIG. 1

Testicular biopsy (Mr. M.J.). Cross section of seminiferous tubule showing only spermatogonia and Sertoli cells. ×250.

plasia in herds of the Highland breed was 25 per cent. By excluding all affected animals from breeding herds the incidence was reduced to 8 per cent by 1942. Erikkson pointed out that the extent of the condition varied from slight involvement of the testes or ovaries, difficult to determine clinically, to gross hypoplasia easily recognized on examination. The effect upon the fertility of the animals varied according to the degree of involvement of the gonads. Affected bulls generally required several attempts to service cows. The lesion in the testes involved the germinal epithelium and not the interstitial cells, with the result that the quality of the semen was subnormal but the sex urge of the bulls and their ability to copulate were not affected. Hancock and Rollinson (1949), Gregory *et al.* (1951), Lagerhoff (1951) and others have drawn attention to genetic forms of infertility in other animals.

Such genetic studies are possible in animals because of their shorter life span and large number of offspring, but in the human being many years are required to produce even one or two generations and the numbers in each generation are few. Isolated examples of apparent inherited infertility in humans are known—details of one family are given in this paper. Unexplained azoöspermia was noted in 2 brothers by Hotchkiss (1944) and in 2 sets of two brothers by Jeffcoate (1946). Trabucco (1948) described testicular biopsies in 7 men who had unexplained azoöspermia. So far as he could ascertain the men were normal in all respects and none had suffered from any condition known to depress fertility. In the 7 cases the seminiferous tubules showed complete absence of germinal epithelium. Trabucco did not regard this as an atrophy but rather in the nature of an agenesis of the germinal epithelium due to some embryological disturbance. He called the condition "congenital sterility".

These examples deal with sterility and have been easily recognized but the inheritance of a degree of subfertility is more difficult to identify. In the light of present knowledge fully half of all cases of male subfertility are unexplained and while one must be guarded in making a comparison between human beings and cattle, it is possible that a hereditary factor may be responsible for lowered fertility in a number of these men.

Summary

Clinical details are given of three brothers and one sister who suffered from primary infertility; the three brothers were found to have azoöspermia.

The possibility that this family suffered from some form of inherited infertility is discussed.

I wish to thank Dr. W. Davidson for the pathological report on the testicular biopsy.

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THE DESIGN OF MALE AMPHIBIAN PREGNANCY TESTS

Application to *Bufo regularis* Reuss

BY

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THE male amphibian pregnancy test is attractive because it offers a simple, accurate, quick and cheap test in places where facilities cannot be provided for one of the established tests, the Aschheim-Zondek, the Friedman and the Hogben. Galli-Mainini (1948a, 1948b) and Frazer (1950) have reviewed the use of 27 species of amphibians for pregnancy diagnosis, but only the male *Xenopus laevis* has been found to be unsuitable, because Robbins and Parker (1949) found that it gave false positives with urine from girls with regular normal menses. Only Aznar-Ferreres (1949), however, has considered the general design of the male amphibian pregnancy test, and he confined himself to suggesting that the appropriate dose of untreated urine should be one-tenth of the average weight of the species used. It will be shown later that this quantity is inadequate for *Bufo regularis*, and a consideration of the numerous papers on male amphibian pregnancy tests suggests that this rule is applicable only to *Bufo arenarum*, if an accuracy similar to that of the established tests is to be achieved.

In Lagos in 1950 the sudden cessation of the supply of mice for Aschheim-Zondek tests necessitated the immediate development of another pregnancy test. *B. regularis* was readily available and had been shown to be suitable for pregnancy diagnosis by Chhung Hin and Webb (1949), Hughes (1949) and Rousselot (1950), but no design of known accuracy was available. There was a need, therefore, for a quick method by which the dose of urine might be predicted for any desired accuracy. Alternatively a method was required by which the accuracy of any design might be predicted. An approximate method satisfying both these needs is presented in this paper.

METHOD

The Hogben test is used as a standard because it is established and accurate (Landgrebe and Hobson (1949) claimed an accuracy of 99·65 per cent in a series of 5,666 tests) and because Landgrebe (1948) has published additional information for the toads used for this test.

It is assumed that both the male amphibian and Hogben tests depend for the detection of pregnancy only on the presence of chorionic gonadotrophin (C.G.) in the urine. This is generally agreed for the Hogben test and the evidence for male amphibians has been reviewed by Galli-Mainini (1948a).

The accuracy of the Hogben test is given as the percentage of correct inferences of pregnancy and of certain other rare conditions. Stated in this way it cannot be assessed in terms of international units (I.U.) of C.G., but if the test depends on the amount of C.G. present there must be a certain minimal quantity which the test will detect with great accuracy. This quantity may be defined as the concentration of C.G. which the test will detect with 99 per cent accuracy, and this quantity will be called the upper limit; 99 per cent is chosen and not 99·65 per cent because it is much easier to calculate with the former percentage and because the error caused by this approximation is slight. For purposes of comparison a lower limit—the concentration of C.G. which the test will detect with an accuracy of 1 per cent—will also be calculated.

From Landgrebe's data for the female *Xenopus laevis*

$$E=-6\cdot39+6\cdot56X \quad \ldots\ldots\ldots\ldots\ldots\ldots 1$$

Variance of slope $=Vb<0\cdot73$

where E = probit

$X=\log_{10}$ dose of C.G. in I.U.

In one test 30 ml. of urine is given to each toad, whence equation 1 may be written.

$$c = \frac{1}{30}\,\text{al}\,\frac{E+6\cdot39}{6\cdot56} \quad \ldots\ldots\ldots\ldots\ldots\ldots 2$$

where c=concentration of C.G. in the urine in I.U./ml.

Let p=probability of a toad being positive

$q=1-p$

The Hogben test uses 2 toads, hence the expansion of $(q+p)^2$ will give the frequencies of the possible observations of neither toad positive (oo), 1 toad positive out of 2 (+o) and both toads positive (++).

For 99 per cent accuracy:

$$2qp+p^2=0\cdot99$$
$$p=0\cdot9$$

For 1 per cent accuracy:

$$2qp+p^2=0\cdot01$$
$$p=0\cdot005$$

These values of p, written as percentages, may be converted to probits and substituted in equation 2, giving values for c of 2·85 I.U./ml. and 0·74 I.U./ml. The interpretation of these figures is that if 2·85 I.U. of C.G./ml. is present a positive response, either +o or ++, may be expected in 99 per cent of trials, and in 1 per cent of trials for the lower concentration. The range is 0·74 I.U./ml. to 2·85 I.U./ml.

If the dose response line for a species of male amphibian is known, upper and lower limits for any dose of urine and any number of animals used in each test may be calculated as for the Hogben test. If equal doses of urine are given to each animal the appropriate partial sum of the appropriate binomial expansion is used. If the dose is chosen so that the upper limit is 2·85 I.U./ml. the accuracy of the design will be very close to the accuracy of the Hogben test.

A pregnancy test may be defective both from false positive and from false negative results. Considering for the present only false negative results, the accuracy may be stated either as the percentage accuracy of a large series of tests or as a lower limit. For example, if a test depending on the excretion of C.G. will detect pregnancy in the second and third trimesters with an accuracy of only 70 per cent, it is preferable to state the accuracy for clinical purposes as not less than 70 per cent though the accuracy will probably be much greater for women tested when only 2-months pregnant. Galli-Mainini (1948a) not only reported a series of 2,030 tests but also reported an accuracy of 92 per cent in a series of 84 tests on urines from women 6- to 9-months pregnant, so that the accuracy of his test using *Bufo arenarum* may be given as not less than 92 per cent. This minimum accuracy can be calculated. It will not be the same as the observed accuracy but should be less, because any large series of tests will include tests for moderately early pregnancies, but if the test is very accurate it should approximate to the observed accuracy. If the test is not very accurate, this minimum accuracy should approximate to the observed accuracy of tests where the excretion of C.G. is low.

According to Robson (1947) the excretion of C.G. in the urine in pregnancy rises to a peak between the 50th and 60th days before falling to a minimum at about the 120th day, after which it rises slightly to term. The most accurate figures in I.U. for normal pregnancy are those given by Loraine (1950) who found the mean excretion at the seventeenth week to be 6,270 I.U./24 hours. If the daily excretion of urine is taken as 1,000 ml. to 2,000 ml., as given by Clarke (1946), the mean excretion at the seventeenth week becomes 6·3 I.U./ml. to 3·1 I.U./ml., and 3·1 I.U./ml. may be taken as the minimum concentration to be detected. For the Hogben test:

$$c=3\cdot1 \text{ I.U./ml.}$$
substituting in equation 2
$$E=6\cdot523$$
$$\therefore p=0\cdot9361$$
$$2qp+p^2=0\cdot9959$$

The predicted accuracy is 99·59 per cent and the observed accuracy was 99·65 per cent. This close agreement supports the validity of the method and, further, supports the assumption that the accuracy of the Hogben test will not be less than 99·59 per cent if it is applied to the detection of abnormal pregnancies with a low excretion of C.G.

If this method of predicting the accuracy is valid for the Hogben test it is presumably valid for a male amphibian. If the dose response line is known, E and hence p may be calculated for any dose of urine. The appropriate partial sum of the appropriate binomial expansion may then

be calculated, enabling the accuracy to be predicted.

When applying this method to *B. regularis* it cannot be assumed that the dose response line will remain constant, but if there is an adequate knowledge of the ecology of the species it may be possible to select toads so that the dose response line will remain sufficiently constant for a pregnancy test. Information about the ecology and even the identification of *B. regularis*, however, is scanty, being confined to a paper by Boulenger (1880) and a note by Seetzen (1855). *B. regularis*, therefore, was studied in and around Lagos for a period of 1 year. The results of this study which bear on the identification and selection of males for use are summarized.

Identification and Ecology of *Bufo regularis*

The identification key provided by Boulenger is adequate, but neither his "varietas A" nor his "varietas B" can be identified. These findings are based on more than 700 specimens. In a series of 83 males the weight varied from 15 g. to 138 g. and the snout to vent length from 54 mm. to 107 mm. The correlation coefficient for weight and snout to vent length was 0·89. Forty-two of the series weighed from 50 g. to 70 g. inclusive.

Nuptial pads, croaking and the amplexus reflex are each an exceedingly accurate indication of the male. The throat colour is an inferior sign for detecting the sex.

Breeding occurs throughout the year but is much more common early in June, in July, and in September and October than in the other months. There appears to be a breeding cycle for the male consisting of a period of croaking nightly for the female, followed by mating in water, followed by a period of feeding some distance from water, followed once more by waiting nightly on the bank of a stream or pond and croaking for a female. Males in the pre-mating stage always have well developed nuptial pads and may readily be captured at night near water.

Aestivation does not occur. Abundance of toads during the rainy seasons and scarcity during the dry seasons are due to migration.

Very rarely toads captured in the pre-mating stage have spermatozoa in the cloacal fluid. Of more than 700 male toads in captivity none had spermatozoa in the cloacal fluid 7 or more days either after capture or after being used for pregnancy diagnosis. The male *B. regularis* does not release spermatozoa after injection with adrenaline.

Design of Tests using *Bufo regularis*

Selection of toads

The species should be identified by Boulenger's key, Table I, and the sex by the presence of nuptial pads. As aestivation was not observed nor any definite breeding seasons the only likely sources of heterogeneity are the sex cycle and size. If males are collected at night near water,

Table I

Key for the identification of palaearctic and ethiopian species of Bufo, *from Boulenger* (1880)

1.	Subarticular tubercles under the toes in a single row	5
	Subarticular tubercles in two rows (most of them)	2
2.	First finger not extending beyond second	4
	First finger extending beyond second	*B. mauritanicus*
3.	Parotoids black-edged; interorbital space as broad as the upper eyelid	*B. vulgaris*
	Parotoids not black-edged; interorbital space narrower than the upper eyelid	4
4.	A parotoid-like gland on the upper side of the calf; belly entirely granulate	*B. calamita*
	No large gland on the calf; belly almost entirely smooth	*B. augusticeps*
5.	First finger not extending beyond second	6
	First finger extending beyond second	7
6.	A parotoid-like gland on the upper side of the calf; belly entirely granulate	*B. raddei*
	No large gland on the calf; belly almost entirely smooth	*B. augusticeps*
7.	Parotoids flat, indistinct	*B. carens*
	Parotoids distinct	8
8.	A cutaneous tarsal fold	9
	No tarsal fold	10
9.	Tympanum not more than half the size of the eye; first finger not much longer than second	*B. viridis*
	Tympanum nearly as large as the eye; first finger much longer than second	*B. regularis*
10.	Tympanum distinct	*B. tuberosus*
	Tympanum hidden	*B. taitanus*

and not elsewhere and at other times, only males in the pre-mating stage will be captured. This is also the easiest method of collecting and males should be collected in this way.

With *B. regularis* the correlation of weight and snout to vent length is high, hence either parameter may be used for selection. A suitable range is 50 g. to 70 g. because toads of this size are common.

The diagnosis of positive health is scarcely possible; the best that can be done is to exclude grossly unfit toads. It must be assumed that an active, plump toad, free from ulcers of the skin and blind in not more than 1 eye is a healthy toad.

For the experiments and pregnancy tests to be described all the toads used were identified by Boulenger's key, all had nuptial pads, all were active and plump and free from ulcers, and all weighed from 50 g. to 70 g. inclusive. No toad was used unless it had been stored 7 or more days after capture. The cloacal fluid was always examined before injection but no spermatozoa were ever found at this time.

Determination of the dose response line

The dose response line was determined by two experiments. In the first, 60 toads, which had not been used for pregnancy diagnosis, were allotted at random to 6 dosage groups each of 10 toads, and each group was kept in one of a set of identical jars. A standard solution of C.G. of 5 I.U./ml. was prepared from standard tablets and distilled water and the appropriate dose was given into the dorsal lymph sac by the method described by Crew (1939). The C.G. and distilled water were measured to four significant figures and the syringes were calibrated to four significant figures. The least accurate measurement was probably the volume of standard solution injected, but the accuracy was better than 1 per cent. The dose given to each group is recorded in Table II. The toads were examined 3 hours, 4 hours and 5 hours after injection.

For the second experiment, performed 25 days later, 45 toads, which had not been used either for pregnancy diagnosis or for the first experiment, were allotted at random to give three dosage groups, each of 15 toads. A standard solution of 10 I.U. of C.G./ml. was used. The dose given to each group is recorded in Table II. In all other details this experiment was identical with the first experiment.

Some toads responded during the fourth hour but none negative at the end of 4 hours became positive during the fifth hour. There was no leakage of the injection mass and no toad appeared to be incommoded in any way by these experiments. The results at the end of 4 hours are given in Table II.

TABLE II

Results of two experiments to determine the dose response line of Bufo regularis*; 4 hours elapsed between injecting and reading*

	No. in group	Dose of C.G. in I.U.	Per cent +
Experiment 1 ..	10	5·065	0
	10	10·10	10
	10	14·63	0
	10	19·51	40
	10	24·50	40
	10	30·17	60
Experiment 2 ..	15	10·00	13·33
	15	20·00	46·67
	15	38·68	66·67

The results of each experiment were analyzed by the use of probits as described by Emmens (1948). No heterogeneity was found, $P>0{\cdot}2$ and $P>0{\cdot}5$. The results of the 2 experiments were then combined by Perry's method C (Perry, 1950).

$$E=0{\cdot}61+3{\cdot}08X \quad \ldots\ldots\ldots\ldots\ldots\ldots 3$$

$$Vb=0{\cdot}52$$

Combined chi-square for the 2 slopes:

$$x^2=3{\cdot}221 \quad df=5 \quad P>0{\cdot}5$$

Hence no heterogeneity can be detected; there is no evidence that the method of analysis is unsuitable.

Chi-square for the difference between the slopes:

$$x^2=0{\cdot}9264 \quad df=1 \quad P>0{\cdot}3$$

Hence there is no evidence that the difference in concentration of C.G. in the injection mass affected the slope of the probit log dose line.

If d is the amount of the injection mass in ml. equation 3 may be written

$$c=\frac{1}{d}\,\text{al}\,\frac{E-0{\cdot}61}{3{\cdot}08} \quad \ldots\ldots\ldots\ldots\ldots\ldots 4$$

c and d may also refer to a urine specimen, where c is the concentration of C.G. in the urine in I.U./ml. and d is the amount of urine injected or concentrated for injection in ml.

Evaluation of designs for Bufo regularis

Different designs are evaluated in Table III. The method of calculation has been described. Equation 4 was used.

TABLE III

Evaluation of eight designs for pregnancy tests using Bufo regularis

Test	Range 1 per cent to 99 per cent in I.U./ml.	Percentage Accuracy
Hogben	0·74 to 2·85	99·59
Bufo regularis		
1 toad, 7 ml.	0·67 to 21·6	39·22
2 toads, 7 ml. each, oo reported negative ..	0·55 to 9·93	63·06
3 toads, 7 ml. each, ooo reported negative ..	0·50 to 6·84	77·55
11 toads, 7 ml. each, negative reported if all negative	0·34 to 2·80	99·58
1 toad, 53·2 ml.	0·09 to 2·85	99·26
2 toads, 24·4 ml. each, oo reported negative ..	0·16 to 2·85	99·34
3 toads, 16·8 ml. each, ooo reported negative ..	0·21 to 2·85	99·37
3 toads, 30·0 ml. each, ooo and +oo reported negative	0·28 to 2·85	99·35

Some workers have preferred to give different doses to the 2 or 3 toads used for each test. These designs may be evaluated by a more general method which may be illustrated by considering a 2-toad test. Let p_1, q_1, d_1, E_1, refer to one of the pair and p_2, q_2, d_2, E_2 refer to the other.

For the upper limit:

$$q_1\,p_2+q_2\,p_1+p_1\,p_2=0{\cdot}99$$

To calculate a design with an accuracy similar to that of the Hogben test either d_1 or d_2 must be chosen arbitrarily. If d_1 is chosen, E_1 may be calculated by substitution in equation 4, with 2·85 substituted for c. p_1 may then be obtained from probit tables and p_2 may be calculated, whence d_2 may be calculated.

To estimate the accuracy of any design d_1 and d_2 are given, whence E_1 and E_2 may be calculated corresponding to p_1 and p_2, whence $q_1\,p_2+q_2\,p_1+p_1\,p_2$ may be calculated.

Three or more toad designs may be assessed similarly, but there appears to be no advantage in these unequal dose designs to outweigh the disadvantage of complexity.

False positives

Excluding the male *Xenopus laevis* very few false positives have been reported among thousands of tests using male amphibians, and only with *Rana pipiens*. After an extensive search of the literature reports of false positives have been found only from Gardner and Harris (1950), Marsters, Black and Randall (1950), Sobel and Edelman (1951) and Hause and Decatur (1952). No adequate explanation is available for the 1950 reports. Sobel and Edelman reported 9 false positives with urine from 21 non-pregnant, jaundiced patients. Hause and Decatur obtained false positives by concentrating excessive quantities of urine for injection.

The report of Hause and Decatur suggests that it may be impossible to design an acceptable pregnancy test for any given species. If sufficient urine is given for acceptable sensitivity the incidence of false positives may be excessive; it may be impossible to make the sensitivity both sufficiently high for C.G. and sufficiently low for the substance causing false positives. Table III, however, shows how this problem can be tackled. If false positives occur from excessive sensitivity more toads should be used for each test and less urine should be given to each toad; Table III gives suitable quantities.

False positives with *Bufo regularis* from the spontaneous release of spermatozoa may be eliminated by storing the males for 7 days and by examining the cloacal fluid before use.

The male amphibian pregnancy test would be greatly limited in application if urine from jaundiced patients is liable to cause false positives. That this phenomenon is limited to some species if not to *Rana pipiens*, however, is strongly suggested by the fact that many other species have been used, some very extensively.

particularly *Bufo arenarum*, but no false positives have been reported.

False positives have been reported with the male *Xenopus laevis* and *Rana pipiens*. Robbins and Parker (1949) reported that *X. laevis* and *R. pipiens* released spermatozoa after injection with adrenalin but that *Bufo fowleri* and *Bufo arenarum* did not, confirming an observation made by Galli-Mainini (1947) with *B. arenarum*. *B. regularis* does not release spermatozoa after injection with adrenalin and may be grouped with *B. fowleri* and *B. arenarum* rather than with *X. laevis* and *R. pipiens*.

Experimental Test of Designs for *Bufo regularis*

Method

Three hundred and sixty pregnancy tests were performed during 1 year. As urines had to be accepted for test before a design could be calculated, urines 1 to 235 were tested with a design based on the available reports and reviews. The changes made during the year were slight. Equal doses were given to each of 2 toads for all tests, but for tests 1 to 6 the dose was 5 ml. of urine, for 7 to 33 10 ml., for 34 to 81 5 ml. and thereafter 7 ml. The dose finally chosen was 7 ml. because if a greater quantity of untreated urine was given the mortality and morbidity of the toads under test became excessive. For tests 1 to 235 the duration of each test was 3 hours, thereafter 4 hours.

The urines were submitted by clinicians from all local ethnic groups; about 35 per cent of specimens came from caucasians and the remainder from negroes. Most specimens were first morning specimens but none were rejected unless the quantity was too small or the specific gravity was 1·005 or less.

The technique used was identical with the technique used for determining the dose response line, with the single exception that toads were re-used a maximum of 5 times. This change was made for economy and to obtain information about the stability of the dose response line.

The results of tests were checked after 2 or more months by the clinicians; they received lists of tests done for them and indicated clinical agreement or otherwise.

Results

Of the 360 tests 13 could not be reported because the toads died under test before releasing spermatozoa, and scarcity of toads or lack of urine prevented the test being repeated. Of the remaining 347 tests 279 were checked. There were no false positives and 10 false negatives giving an overall accuracy of 96·4 per cent. Of the 347 tests reported 163 were positive and 184 were negative.

If the method of design is valid and if it has been calculated with sufficient accuracy, the accuracy for 2 toads each receiving 7 ml. should not be less than 63·06 per cent (Table III) and this should be close to the accuracy observed for patients with a known low excretion of C.G. There were 18 urines from 18 such patients in the series. The results for these tests are given in Table IV.

Table IV

Analysis of tests for patients with a known low excretion of C.G.

Diagnosis	Correct +	False —	Total
Aborted later at 8 weeks ..		1	1
Aborted later at 2½ months		1	1
Aborted later at 3 months ..	1	1	2
Threatened abortion ..	1	2	3
Pregnancy with fibroids ..	1		1
Ruptured tubal mole ..	1		1
Second and third trimesters of normal pregnancy ..	8	1	9
	12	6	18

The patient diagnosed as pregnancy with fibroids is included in Table IV because an Aschheim-Zondek test performed in parallel was negative. The accuracy for this group of 18 was 67 per cent, which may be compared with the predicted accuracy of 63 per cent. The dose for all these tests was 7 ml. except for the false negative for the patient who aborted later at 3 months where the dose was 10 ml., the false negative for the patient who aborted later at 8 weeks where the dose was 5 ml., and the correct result for the pregnancy with fibroids where the dose also was 5 ml. The variation of the dose, therefore, cannot have made a significant difference to the percentage accuracy. For

13 of these 18 tests the duration was only 3 hours; 13 tests with 4 false negatives. An extra hour might have raised the accuracy, but further consideration of the experiments to determine the dose response line suggests that no significant increase in accuracy would have occurred. In these experiments 34 toads were positive at the end of 4 hours, but of these toads only 4 were negative at the end of 3 hours.

The 360 tests were evenly distributed throughout the year, so also were the 10 false negatives, 3 occurring in December, 2 in June, and 1 in each of February, May, July, September and October. The stock of toads was so arranged that 30 toads were available for use on the first day of each month, survivors being discarded on the first day of the following month. These toads were re-used for tests a maximum of 5 times at intervals of 7 days, provided they satisfied the criteria for selection. Three false negatives occurred in the first week of a month, 2 in the second week, 3 in the third and 2 in the fourth. Hence the criteria for selection appear to be adequate to maintain a sufficiently constant dose response line, in spite of the changing seasons and the re-use of toads.

For 34 tests the urine was inadvertently preserved with chloroform, giving a mortality among the toads under test of 28 per cent. For the remaining tests the mortality under test was 7·7 per cent. There was also a considerable late mortality.

Discussion

The validity of any approximate method of design, such as has been given in this paper, must be a matter of opinion. It is possible only to search for fallacies in the argument by which the method was deduced and to estimate the error which has been introduced by successive approximations and assumptions. The argument on which the method of design is based has been set out as each step was taken. Furthermore this argument is not new, any novelty being confined to its application. The method was then checked by calculating the accuracy of the Hogben test, and the calculated accuracy of 99·59 per cent was found to be close to the observed accuracy of 99·65 per cent. An additional check can be obtained from *Bufo melanostictus*. Mohanty and Pabrai (1951) have published the dose response line for this species which they have used for pregnancy diagnosis (Mohanty and Pabrai, 1950). They reported an accuracy of 79 per cent with 122 urines from 65 women 37- to 40-weeks pregnant, which may be compared with the calculated accuracy of 83 per cent, obtained by using the figure given by Loraine (1950) for the mean excretion of C.G. at the thirty-seventh week. If the method is valid, however, its application to any species depends on the accuracy with which the dose response line has been determined and on the stability of this line. For *B. regularis* 105 toads were used for the determination of the dose response line, giving 0·52 for Vb, and the check of predicted against observed accuracy was then applied. The predicted accuracy was 63 per cent and the observed accuracy 67 per cent in a series of 18. The stability of the dose response line was assessed by observing the distribution of false negatives, no significant instability being observed. It is considered, therefore, that any of the designs given in Table III, with an upper limit of 2·85 I.U./ml., can be recommended as being as free from false negatives as the Hogben test, and further confidence in these designs may be obtained from the observation that the recommended dose of urine, which must be suitably concentrated for injection even for the 3-toad designs, is not less than about one-third of the average weight of the species.

The incidence of false positives for any design can only be estimated by direct experiment. Very few false positives have been reported and all with only 2 species of amphibian. Such information as is available has been presented and it is clear that the substance or substances causing false positives are unknown. In any design for *B. regularis* no accurate statement can be made about the incidence of false positives, except that with the design in which each of 2 toads receive 7 ml. of urine false positives are unlikely, and that no false positives have yet been reported for any species of *Bufo*. It seems reasonable, therefore, to recommend that in Lagos a 2-toad test in which each toad receives 25 ml. of urine suitably concentrated should be used, if the accuracy of the Hogben test is required. False positives are unlikely to occur

with this design, but if a false positive should be reported the design should immediately be changed to a 3-toad design, in which each toad receives 15 ml. of urine suitably concentrated.

Summary

(1) A method is described by which a male amphibian pregnancy test of known accuracy may be designed.

(2) The Hogben test is used as a standard and is assessed in terms of I.U. of C.G. It is deduced that if 2·85 I.U. of C.G./ml. of urine is present a positive test will be obtained in 99 per cent of tests with this urine. If the dose response line for the male amphibian is known, the dose of urine for any particular design may be calculated so that a positive test may be expected in 99 per cent of tests with a urine containing 2·85 I.U. of C.G./ml. It is then assumed that this design will be as accurate as the Hogben test.

(3) The method of design is checked by calculating the accuracy of the Hogben test; the calculated accuracy of 99·59 per cent is close to the observed accuracy of 99·65 per cent.

(4) The method of design is applied in detail to *Bufo regularis*. The dose response line is given and 8 designs for tests are assessed.

(5) A series of 360 pregnancy tests with *B. regularis* are reported, and the accuracy is compared with the predicted accuracy. There were no false positives.

(6) The available information about false positives in pregnancy tests using male amphibians is reviewed.

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THE PLACENTAL TRANSFER OF AMINO-ACIDS IN NORMAL AND TOXAEMIC PREGNANCY

BY

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THE passage of amino-acids across the placenta has been studied for many years. Morel and Mouriquand (1913), using the Van Slyke (1912) method of amino-acid estimation, found no difference between human foetal and maternal whole blood amino-acid levels, and were thus able to postulate simple diffusion of amino-acids across the placenta. Rabinovitch (1914), using the same method, found the foetal to exceed the maternal levels.

Morse (1917) studied 17 pregnant women, and found a higher level of presumed amino-acid nitrogen in plasma from the umbilical cord than in the maternal plasma. His mean values, using the gasometric nitrous acid method of Van Slyke (1912) which estimates all primary aliphatic amines, were 6·4 mg./100 ml. in the maternal and 8·7 mg./100 ml. in the foetal plasma. Hellmuth (1924) and Plass and Matthew (1925), using the Folin (1922) method, also found higher foetal than maternal plasma levels, suggesting either a diffusion gradient from foetus to mother, or an active process involved in the transfer of amino-acids from mother to foetus. Luck and Engle (1929) disputed this evidence, and revived the simple diffusion theory.

Settlement of this question awaited the development by Hamilton and Van Slyke (1943) of an analytical method which was more specific for amino-acids. Christensen and Streicher (1948), using this manometric ninhydrin method, showed that the amino-acid level of foetal plasma was considerably higher than that of the mother, foetal/maternal ratios being 5/1 for the guinea pig, 1·5 to 2/1 for the rabbit, and 1·7 to 1·8/1 in the human. They further supported the hypothesis of active placental transfer of amino-acids by showing that, after glycine was fed to the pregnant guinea pig, this amino-acid appeared in higher concentration in the foetal than in the maternal plasma, while feeding L-glutamic acid resulted in concentrations of over 40 mg./100 ml. of alpha-amino-nitrogen in the foetal plasma without any effect upon the foetal plasma glycine level.

Crumpler, Dent and Lindan (1950) estimated the total alpha-amino-nitrogen content of human maternal and foetal plasma in 9 cases; they also estimated the plasma content of the individual amino-acids by paper chromatography. This work confirmed the findings of Christensen and Streicher, and gave 1·6/1 as the normal human ratio; it also showed that the increased foetal level involved all the individual amino-acids commonly found in these fluids. However, in 4 of the 9 experiments a low foetal/maternal ratio was found. Since these exceptions were cases of toxaemia of late pregnancy, the authors suggested that this altered ratio might indicate some impairment of placental function in toxaemia. Their chromatographic findings were complete in themselves, but the low ratio found in 4 cases of toxaemia clearly called for further study before any conclusions could be reached.

It is the purpose of the present investigation of a larger series to determine whether or not the ratio differs significantly from normal in pre-eclamptic toxaemia.

Method

About 10 ml. of human foetal blood was collected from the umbilical vein at the moment of birth, with a dry sterile needle and syringe. This technique avoided the possibility of contamination with Wharton's jelly or tissue fluid which may occur when cord blood is obtained from the cut end of the cord. After removing the needle, the blood was ejected into a bottle containing 500 T.U. of dry heparin.*

Maternal blood was obtained from the antecubital vein within 3 minutes of childbirth, and was similarly transferred to a heparin bottle. The two blood samples were centrifuged within half an hour of collection, and plasma obtained from each was stored at minus 10° C. until analysis. Any specimen showing haemolysis was discarded.

Duplicate (free) alpha-amino-nitrogen estimations were carried out on the plasma samples by the ninhydrin manometric carbon dioxide method of Hamilton and Van Slyke (1943), and 0·2 mg./100 ml. was taken as the outside limit for duplicates. Only cases in which the duplicates in both maternal and foetal plasma analyses fell within these limits are included in this paper. Thus each result in the tables represents the mean of duplicate estimations.

At first some difficulty was experienced in analysing plasma from patients for whom certain anaesthetics, such as ether, vinesthene or nitrous oxide, had been used at delivery. The recommended one minute boiling of the picric acid filtrate to eliminate carbon dioxide did not remove all dissolved anaesthetic gas, and this interfered with the analyses. This error was minimized by evacuating the measured 5 ml. of filtrate twice or three times with a high vacuum pump at or just above room temperature.

In this study no amino-acid estimations have been carried out by the less specific colorimetric method of Frame, Russell and Wilhelmi (1943), although this might prove of great interest in view of the relative increase in the apparent amino-acid levels given by this method during labour and the early puerperium (Bonsnes, 1947). The discrepancy suggests that there is at this time an increased amount of some substance in the blood which reacts with beta napthoquinone-4-sulphonate but not with ninhydrin.

* The heparin used as anticoagulant was analyzed and found to contain no detectable amino-acid impurity.

Results†

The amino-acid levels of 43 pairs of maternal and foetal plasma samples are presented here; in every case the foetal amino-acid level was higher than the maternal.

Full notes were made of the details of all cases, and thus it was possible to consider factors other than toxaemia which might conceivably influence the results. Although some abnormalities, such as placenta praevia with partial separation of the placenta before delivery, occurred only once in the series (see Table VI) yet coiling of the umbilical cord round the neck complicated delivery with sufficient frequency to enable its effects to be assessed.

The cases are set out in six tables with details concerning maternal blood pressure before labour, proteinuria, method of delivery, anaesthesia or analgesia, and the maturity, sex, and birth weight of the babies.

The mean foetal/maternal alpha-amino-nitrogen ratio of each group is shown in the tables. It may be seen that while this figure is 1·65/1 for 11 normal cases, it is 1·38/1 for 7 comparable cases where the umbilical cord was coiled round the neck. These results are significantly different at the 1 per cent level using the "t" test.

It would therefore appear necessary in comparing normal and toxaemic pregnancy to exclude all such cases, and for this reason the accompanying tables have been arranged so that cases of "cord round the neck" are separated from the remainder. While the mean ratio for 11 non-toxaemic cases was 1·65/1, this figure dropped to 1·56/1 in 9 cases of mild toxaemia and to 1·37/1 in 10 cases of severe pre-eclampsia (see Fig. 1). Statistical treatment with analysis of variance according to Fisher (1936) shows that these ratios are significantly different at the 5 per cent level. This suggests that the ratio decreases with the severity of toxaemia.

The mean foetal levels in Tables I to IV do not differ significantly.

† The results are not corrected for urea.

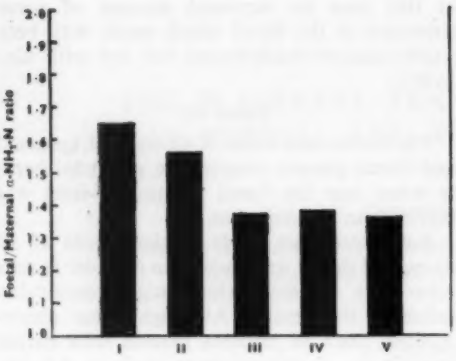

FIG. 1

Mean foetal/maternal amino-acid ratios in five clinical groups.

Group I Non-Toxaemic (11 cases).
II Mild Toxaemia (9 cases).
III Pre-Eclampsia (10 cases).
IV Non-Toxaemic—cord round neck (7 cases).
V Toxaemic—cord round neck (4 cases).

The maternal levels in the cases of "cord round the neck" (Table IV) differ significantly at the 1 per cent level from the normal group (Table I), and while the maternal levels in the cases of pre-eclampsia (Table III) differ significantly at the 5 per cent level from those of the normal group, no significant difference is apparent if the levels in Tables I, II and III are compared by analysis of variance.

DISCUSSION

It will be seen from Fig. 2 that the fall in the foetal/maternal plasma alpha-amino-nitrogen ratio in pre-eclamptic toxaemia is brought about by a rise in the maternal level, rather than by a fall in the foetal level, which one might have expected from failure of placental amino-acid transfer.

Since, however, the lowered ratio of "cord round the neck", which is a purely foetal condition, also shows this effect, it seems probable that there is decreased foetal amino-acid uptake from the maternal blood in both these conditions due either to impaired placental amino-acid transfer or to impaired foetal amino-acid utilization (or both).

It could be argued that the significantly lower foetal/maternal alpha-amino-nitrogen ratio found in toxaemic pregnancy might be due to prematurity, since groups 1, 2 and 3 are not strictly comparable from this aspect.

It has already been shown, however, that the lower ratio in toxaemia is due to a higher maternal level, and Bonsnes (1947) has shown that the normal maternal level does not alter between the 9th week of pregnancy and term. In addition, a ratio of 1·7/1 was found in 1 non-toxaemic patient (No. 9, Table I) whose pregnancy was interrupted by elective Caesarean section 31 days before the expected date of delivery. There is no reason therefore to suppose that the low ratio in the toxaemic group is due to prematurity.

Bonsnes showed that the maternal amino-acid level is lowered during pregnancy (average 3·2 mg./100 ml.), returning to a normal level (4·3 mg./100 ml.), on the 1st or 2nd day postpartum.

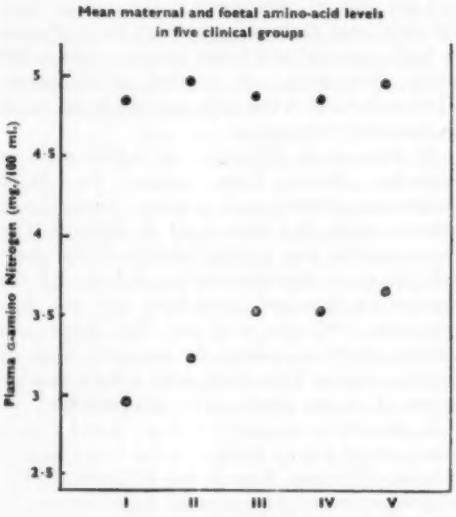

FIG. 2

● Mean foetal level ⊙ mean maternal level.

Group I Non-Toxaemic (11 cases).
II Mild Toxaemia (9 cases).
III Pre-Eclampsia (10 cases).
IV Non-Toxaemic—cord round neck (7 cases).
V Toxaemic—cord round neck (4 cases).

Christensen and Streicher (1948) attributed the lowered plasma amino-acid level which they found in the pregnant guinea pig to the active placental transfer of amino-acids to the foetus which they had demonstrated. There was, however, only circumstantial evidence that this was the cause of the low maternal level in pregnancy.

The present observation that the maternal amino-acid level was significantly higher in cases where the cord was round the neck, than in cases where this complication did not arise, must mean that the placental transfer or foetal utilization of amino-acids was already becoming slowed by cord obstruction during labour. It is strong

TABLE I

Non-toxaemic

	Maturity days from E.D.D.	B.P. before labour	Proteinuria g./litre	Method of delivery	Anaesthesia	Sex	Birth weight g.	Maternal Plasma α-NH_2-N (mg./100 ml.)	Foetal Plasma α-NH_2-N (mg./100 ml.)	Foetal/Maternal α-NH_2-N ratio
1	+3	120/80	0	Sp.V.	Trilene	M	3,640	2·83	4·89	1·73
2	−4	100/80	0	Sp.V.	Trilene	F	3,160	2·76	5·09	1·84
3	−19	80/40	0	Sp.P.O.P.	Trilene	F	2,750	2·92	5·39	1·85
4	+19	100/60	0	Sp.V.	None	M	3,440	2·65	4·03	1·52
5	−5	106/78	0	Sp.V.	Trilene	F	3,530	2·64	4·42	1·67
6	−6	110/78	0·5 in labour	C.S.	Spinal	M	2,490	3·71	5·40	1·46
7	+4	104/63	0	C.S.	Spinal	M	3,250	2·75	5·11	1·86
8	−7	108/64	0	C.S.	Spinal	M	3,050	3·11	4·69	1·51
9	−31	116/70	0	C.S.	Spinal	M	2,720	2·50	4·31	1·72
10	−4	90/60	0	C.S.	Cyclo.	M	2,840	3·27	4·66	1·43
11	+3	120/80	0	C.S.	Cyclo.	F	4,400	3·41	5·20	1·53
								2·96 ± ·11	4·84 ± ·14	1·65 ± ·049

TABLE II

Mild Toxaemia

	Maturity days from E.D.D.	B.P. before labour	Proteinuria g./litre	Method of delivery	Anaesthesia	Sex	Birth weight g.	Maternal Plasma α-NH_2-N (mg./100 ml.)	Foetal Plasma α-NH_2-N (mg./100 ml.)	Foetal/Maternal α-NH_2-N ratio
1	−8	130/90	0	Sp.V.	Trilene	M	3,320	2·47	4·48	1·81
2	+22	130/78	0·5 in labour	Forceps	Ether	M	3,750	4·61	5·98	1·30
3	+6	140/90	0	Forceps	N_2O	M	4,500	3·62	4·53	1·25
4	?	140/90	0·5	Sp.V.	Local	M	3,000	2·92	5·32	1·82
5	−1	142/78	0	Sp.V.	Vinesthene	M	4,570	3·16	5·60	1·77
6	+2	130/96	0·5	Breech	Vinesthene	F	2,130	3·41	5·75	1·69
7	−8	142/88	0	Sp.V.	N_2O	F	2,890	2·94	3·87	1·32
8	−13	140/94	0	C.S.	Cyclo.	F	2,330	2·72	4·38	1·61
*9	−5	160/80	0	Sp.V.	Trilene	F	3,530	3·21	4·73	1·47
								3·23 ± ·21	4·96 ± ·24	1·56 ± ·077

* Essential Hypertension made worse by pregnancy.

TABLE III

Pre-eclampsia

Maturity days from E.D.D.	B.P. before labour	Protein-uria g./litre	Method of delivery	Anaes-thesia	Sex	Birth weight g.	Maternal Plasma α-NH_2-N (mg./100 ml.)	Foetal Plasma α-NH_2-N (mg./100 ml.)	Foetal/Maternal α-NH_2-N. ratio
1 −10	174/126	0·5	Sp.V.	Trilene	M	2,835	2·79	4·71	1·69
2 +1	154/90	0·5	Sp.V.	None	F	4,500	4·49	6·57	1·46
3 +16	150/100	2·0 in labour	Sp.V.	Trilene	M	3,400	3·75	5·78	1·54
4 0	148/94	1	C.S.	Cyclo.	F	3,170	3·79	4·80	1·27
5 +10	154/100	5	C.S.	N_2O	F	2,620	2·94	4·05	1·38
6 −37	160/126	5	C.S.	Vines-thene	M	2,270	4·90	5·30	1·08
7 −38	195/145	4	C.S.	Local	F	2,300	3·07	4·47	1·46
8 −25	190/120	3	C.S.	Vines-thene	F	2,300	2·97	4·99	1·68
*9 −74	190/110	5	C.S.	Cyclo.	F	765	3·07	3·14	1·02
10 −13	164/106	0	C.S.	Vines-thene	M	3,370	3·45	3·89	1·13
							3·52 ± ·22	4·87 ± ·31	1·37 ± ·076

* Lived for 5 days only.

TABLE IV

Non-toxaemic—Cord round Neck

Maturity days from E.D.D.	B.P. before labour	Protein-uria g./litre	Method of delivery	Anaes-thesia	Sex	Birth weight g.	Maternal Plasma α-NH_2-N (mg./100 ml.)	Foetal Plasma α-NH_2-N (mg./100 ml.)	Foetal/Maternal α-NH_2-N ratio
1 −2	120/70	0·5 in labour	Forceps	Cyclo.	M	3,870	3·82	5·45	1·43
2 −5	112/80	0	Sp.V.	N_2O	M	2,620	3·19	5·16	1·62
3 +4	132/74	0	Sp.V.	Trilene	M	3,430	3·21	4·13	1·29
4 −3	128/80	0	Sp.V.	None	M	2,950	3·24	4·39	1·36
5 0	118/80	0	Forceps	Vines-thene	M	3,720	3·39	4·55	1·34
6 +15	116/88	0	Sp.V.	Trilene	M	3,440	4·26	5·38	1·26
7 −2	112/68	0	Sp.V.	Trilene	F	2,700	3·53	4·87	1·38
							3·52 ± ·15	4·85 ± ·19	1·38 ± ·045

TABLE V

Toxaemic—Cord round Neck

Maturity days from E.D.D.	B.P. before labour	Protein-uria g./litre	Method of delivery	Anaes-thesia	Sex	Birth weight g.	Maternal Plasma α-NH_2-N (mg./100 ml.)	Foetal Plasma α-NH_2-N (mg./100 ml.)	Foetal/Maternal α-NH_2-N ratio
*1 +21	150/100	0	Forceps	N_2O	F	2,410	4·17	5·26	1·26
2 −13	140/74	1	Forceps	Cyclo.	F	3,590	3·20	4·89	1·53
3 +2	150/100	1	Forceps	Cyclo.	M	3,680	3·37	3·89	1·15
4 −2	160/105	0	Sp.V.	Trilene	M	3,615	3·87	5·77	1·49
							3·65 ± ·22	4·95 ± ·40	1·36 ± ·091

* Stillborn.

TABLE VI

Cases Abnormal in Other Ways

	Maturity days from E.D.D.	B.P. before labour	Protein-uria g./litre	Method of delivery	Anaes-thesia	Sex	Birth weight g.	Maternal Plasma α-NH_2-N (mg./100 ml.)	Foetal Plasma α-NH_2-N (mg./100 ml.)	Foetal/ Maternal α-NH_2-N ratio
1	−13	110/68	0	C.S.	Cyclo.	M	2,800	3·63	4·62	1·28
	(Placenta praevia—Partially Separated)									
2	+1	180/110	0	C.S.	Cyclo.	F	3,770	2·84	4·40	1·55
	(Coarctation of the aorta)									

Showing the maternal and foetal plasma α-amino-nitrogen levels, and the Foetal/Maternal α-amino-nitrogen ratios of 43 cases divided into the groups as described in the text. Standard errors of the means of these values are given for the first five groups.
Under methods of delivery: Sp.V.=spontaneous vertex; P.O.P.=persistent occipito-posterior; C.S.=Caesarean section.
Under anaesthesia: Cyclo.=Cyclopropane and oxygen.
E.D.D.=expected date of delivery.
α-NH_2-N=α-amino-nitrogen.

evidence that the lowering of the maternal amino-acid level in pregnancy is due to the transfer of amino-acids to the foetus.

Blood samples were taken from two patients (No. 7, Table IV, and No. 2, Table I) before, during and after delivery, while on a non-protein diet of glucose and fruit drinks. In one case the cord was round the neck of the child at birth, and in the other there was no obvious cord obstruction.

Analysis of these samples (Fig. 3) confirms the findings of Bonsnes, that the maternal amino-acid level returns to a non-pregnant level shortly after delivery. It is interesting to note that in both cases the amino-acid level was already rising before delivery, although Bonsnes found no change during normal labour. This suggests that minor degrees of cord obstruction or placental impairment occurred during labour (Fig. 3).

The decrease in the placental transfer of amino-acids in "cord obstruction" is probably limited to the latter part of the second stage of labour, and is of itself no detriment to the foetus. On the other hand, the decreased amino-acid transfer in severe toxaemia of late pregnancy may continue throughout the period when foetal growth and nitrogen storage (Kelly, Sloan, Hoffman and Saunders, 1951) would normally be at their greatest.

This may explain the well-known clinical impression that foetal growth is impaired in severe toxaemia; it may also partly account for the decreased nitrogen storage found by Mukherjee and Govan (1951) in nitrogen balance studies of patients with hypertensive toxaemia.

The cause of this impairment of placental function in toxaemia is uncertain, but the similarity between "cord obstruction" and "toxaemia" which was found in a study of the oxygen saturation of umbilical artery and vein blood at birth (Clemetson and Churchman,

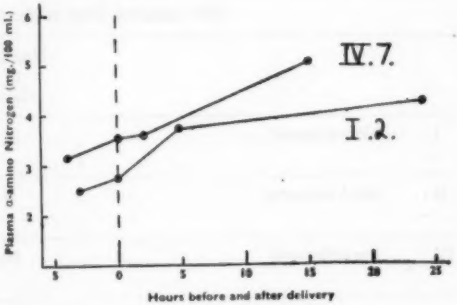

FIG. 3

Antepartum and postpartum amino-acid levels of two women on a protein free diet. (Glucose drinks only.)

IV 7 Cord round the neck.
I 2 Born in a caul.

1953), is equally manifest in the present study of maternal and foetal amino-acid levels.

It would seem that a certain volume rate of blood flow in the umbilical circuit is essential for the normal placental transfer of amino-acids or for their utilization by the foetus.

Summary

(1) The plasma alpha-amino-nitrogen levels of maternal and foetal blood from 43 patients are presented. In every case the foetal level was higher than the maternal.

(2) The normal foetal/maternal alpha-amino-nitrogen ratio was found to be 1·65/1.

(3) This ratio was reduced to 1·56/1 in mild toxaemia and to 1·37/1 in severe toxaemia.

(4) When the umbilical cord was coiled round the baby's neck at birth in otherwise normal cases, the ratio was decreased to 1·38/1.

(5) These changes in the foetal-maternal alpha-amino-nitrogen ratio were brought about by a rise in the maternal level rather than by a fall in the foetal level.

Conclusions

(1) The low maternal plasma amino-acid level in pregnancy is caused by the active transfer of amino-acids to the foetus.

(2) The placental function of transferring amino-acids to the foetus is impaired in toxaemia of pregnancy.

Addendum

Since this report was prepared, Burt has published a paper entitled " 'Combined' and Free Plasma Alpha-Amino Nitrogen in Normal Pregnancy and Toxemia" (*Amer. J. Obstet. Gynec.*, **65**, 304, 1953).

Unfortunately he has dealt only with maternal blood, but it is interesting to observe an increased free plasma alpha-amino-nitrogen level in his figures for toxaemic women before delivery. Fig. 1 shows the mean free plasma alpha-amino-nitrogen level in normal pregnancy to be approximately 3·0 mg./100 ml., while Fig. 2 shows approximately 3·6 mg./100 ml. as the mean level found in toxaemic pregnancy. This difference is not, however, apparent in his tables, which apply to another group of patients.

Acknowledgments

We wish to express our gratitude to the Board of Governors of University College Hospital for their generosity which made this work possible, to the Council of the Section of Obstetrics and Gynaecology of the Royal Society of Medicine

Table VII

Mean Maternal and Foetal plasma amino-acid levels and mean Foetal/Maternal amino-acid ratios in five clinical groups

(The standard error of the mean is given below each figure)

		Number of Cases	Maternal α-NH_2-N (mg./100 ml.)	Foetal α-NH_2-N (mg./100 ml.)	Foetal/Maternal α-NH_2-N ratio
I	Non-toxaemic	11	2·96 ±·11	4·84 ±·14	1·65 ±·049
II	Mild toxaemia	9	3·23 ±·21	4·96 ±·24	1·56 ±·077
III	Pre-eclampsia	10	3·52 ±·22	4·87 ±·31	1·37 ±·076
IV	Non-toxaemic—cord round neck ..	7	3·52 ±·15	4·85 ±·19	1·38 ±·045
V	Toxaemic—cord round neck	4	3·65 ±·22	4·95 ±·40	1·36 ±·091

for their support, and to Professor W. C. W. Nixon for his encouragement and advice. We also wish to thank Mr. N. W. Please for his statistical advice, and the nursing and medical staffs of the Obstetric Hospital, University College Hospital, for their co-operation.

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INVESTIGATION AND TREATMENT OF FEMALE GENITAL TUBERCULOSIS

BY

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SINCE the introduction of streptomycin, para-aminosalicyclic acid (P.A.S.) and isonicotinic acid hydrazide (isoniazid), considerable interest has been taken in the use of these drugs in the treatment of female genital tuberculosis and many workers have reported encouraging results, although of necessity the period of follow-up in their reports has been short.

The present series commenced in September, 1949 and comprises 36 patients who have been kept under observation for 2 to 3 years since receiving treatment. The first 2 patients received streptomycin only, the others received streptomycin and P.A.S. Unless toxic manifestations appeared, 1 g. streptomycin and 15-20 g. P.A.S. were given daily for 90 days. During this initial 3-months course the patients remained under observation in hospital, although they were fully ambulant.

All the patients who did not respond to the above treatment have subsequently been given a course of isoniazid, 100 mg. twice daily for 8 weeks, and the early results of the isoniazid treatment are described.

METHOD OF STUDY

In every case in the series diagnosis was confirmed by the positive histological findings of tuberculous endometritis on two separate occasions, and in the majority of cases guinea-pig inoculation gave a positive result for tuberculosis. The organism was typed in every case where a culture was obtained. The urinary system was investigated as a routine by examination of a 24-hour collection of urine for tubercle bacilli, and by cystoscopy and pyelography where indicated. Vaginal discharge, if present, was examined by fluorescent microscopy, the chest and abdomen were examined radiologically, and, in more than half the cases, tubal insufflation with carbon dioxide was carried out prior to treatment and again after 2- to 3-years surveillance. On conclusion of treatment every patient was examined under sodium thiopentone anaesthesia and the uterus was curetted. A very small curette of standard pattern was used, which required little or no dilatation of the cervix. Endometrium obtained was examined histologically, and bacteriologically by guinea-pig inoculation and culture. Curettage was always carried out in the immediate pre-menstrual phase to ensure that a reasonable quantity of endometrium was obtained, and to allow time for development and spread of the tubercles. Similar examinations were repeated at intervals during the period of surveillance.

Full curettage was used in preference to biopsy as Sharman (1952) has pointed out that negative results may be obtained at subsequent biopsies in cases known to be suffering from tuberculous endometritis and who have had no treatment. Some of these misleading negative findings may well be attributed to the small amount of material obtained.

In the present series, repeat curettage at different intervals prior to treatment showed tuberculosis in every case but 1. The endometrium from this patient (Case 22), 2½ years after the initial diagnosis, did not show histological evidence of tuberculosis on routine examination of one section, but guinea-pig inoculation with the same specimen was positive for tuberculosis. Serial sections at different thicknesses of the block of endometrium were subsequently examined and tuberculosis was then seen histologically. Since this incident the writer has made a point of examining serial sections in every case where the endometrium in

a single section showed chronic endometritis but no definite tuberculosis.

Table II provides further details of the various intervals elapsing between the first and second pre-treatment curettage.

Review of Cases

Age and parity. All patients in this series were between the ages of 19 and 39 years. Twenty-nine were married and 7 unmarried. Of the 29 married patients, 4 were parous and 25 nulliparous, and of 22 cases, where tubal insufflation was carried out prior to treatment, tubal blockage was apparent in 19.

Symptomatology. Table I summarizes the presenting symptoms of these patients. It will be seen that abdominal pain is the presenting symptom in over one-third of the cases. Further investigation of the pain showed that, in 9 of these cases, the pain was not related particularly to menstruation and, in the remaining 6 cases, the pain was worse in the pre-menstrual phase.

Menorrhagia was the most frequent menstrual disorder, and 9 patients had no symptoms whatever, unsuspected tuberculosis of the endometrium being discovered during the routine investigation of sterility.

The duration of symptoms varied from a few months to 4 years.

Presence of adnexal lesions. While the discovery of tuberculous endometritis does not necessarily imply the co-existence of tuberculous salpingitis (Eriksen, 1947), it is reasonable to assume that, in the majority of patients with tuberculous endometritis, the tubes are also involved, particularly if tubal blockage is apparent after tubal insufflation tests in cases where no adnexal lesion is palpable. The adnexal findings in the present series were as follows:

No palpable adnexal lesions	12 cases
Slight adnexal swellings	9 cases
Moderate and large adnexal masses	15 cases

Tubal insufflation in the 12 patients with no obvious adnexal lesion showed patency of the tubes in 2 cases, and non-patency in 10 cases.

Adnexal masses were more frequent in patients complaining of menstrual disorders or pain than in patients complaining only of sterility.

Extra-genital lesions in the past. It is accepted that genital tuberculosis is almost invariably a secondary spread from a primary focus elsewhere in the body and in the present series an endeavour was made to trace a previous infection. In 10 of the 36 cases there was neither history nor evidence of a previous infection. In the remaining 26 cases the various extra-genital lesions were as follows:

Pulmonary tuberculosis	11 (4 still active)
Abdominal tuberculosis (ascites)	5
Calcified mesenteric glands	1
Pleurisy with residual pleural thickening ..	2
Tuberculous knee joint ..	2
Tuberculous spine ..	1 (still active)
Tuberculous neck glands	1
Tuberculous elbow and pleurisy	1
Sacro-iliac tuberculosis ..	1

Two of the patients with old pulmonary lesions also had a history of abdominal tuberculosis with ascites, and a third showed calcified mesenteric

Table I

Symptomatology

	Abdominal Pain	Menstrual Disorders		Sterility Only
		Amenorrhoea	Menorrhagia	
Married Patients	13	3	4	9
Unmarried Patients	2	1	4	—
Totals	15 (41·7 per cent)	4 (11 per cent)	8 (22 per cent)	9 (25 per cent)

glands. In 4 of the patients with pulmonary lesions the disease was still active and required treatment, one patient eventually requiring a thoracoplasty to control the disease. In no instance was co-existent renal tuberculosis discovered, thus supporting the view that coincidental genital and renal tuberculosis in the female is extremely uncommon.

There was no consistency in the interval elapsing between a known primary infection and the onset of symptoms leading to a diagnosis of genital tuberculosis. This interval extended from a few months to many years.

Bacteriology

(1) *Guinea-pig inoculation with endometrial tissue* was carried out before treatment in 33 of the 36 cases with the following results:

Guinea-pig positive for tuberculosis	27 cases
Guinea-pig negative for tuberculosis (with positive histology twice)	6 cases
Not inoculated	3 cases

Further comment on the results of guinea-pig inoculation seems necessary as two different techniques were employed.

Endometrium was collected aseptically and wrapped up in gutta percha that had been sterilized by immersion in 5 per cent carbolic solution and then washed in sterile normal saline. The gutta percha was wrapped in thick gauze to prevent excessive chilling and the specimen transferred to the laboratory as soon as possible. The two different methods of preparation of the endometrium were as follows:

On the one hand, the endometrium was cut up and emulsified in sterile normal saline. It was then placed in 4 per cent sodium hydroxide, shaken for a few minutes and put into an incubator at 37 degrees centigrade for half to one hour, until complete disintegration had taken place. The solution was then centrifugalized and the deposit neutralized to ph 7 with N/$_1$ Hcl. Supernatant fluid was poured off and 1 ml. of normal saline added. 0·5 to 1 ml. of the mixture was injected into the thigh of the guinea-pig near the inguinal glands.

In the second method the endometrium was emulsified with a few drops of sterile normal saline, using a special glass homogenizer. The emulsion was sucked up in a syringe and the untreated material was then injected under the skin of the abdominal wall of the guinea-pig.

Using the treated material of the first method described, 104 animals were inoculated. Eighteen animals died within 3 weeks of injection, no sign of tuberculosis being found, and on 5 occasions, when the material was positive for tuberculosis histologically, a negative result was obtained from the inoculation.

Using the untreated endometrium of the second method, 62 animals were inoculated. Only 1 animal died, death occurring the day after inoculation. On 24 occasions, when the histology showed tuberculosis, a positive finding of tuberculosis was also obtained in 23 animals.

It is apparent that the use of untreated material gives more accurate results, and this method is now the only one utilized in the present series. It is very important when assessing the results of treatment to have repeated examinations at intervals, because, as has been shown above, a single negative finding may be erroneous, even with the use of untreated material, although by this method it is very unlikely that repeated negative results will be obtained if the tuberculous process is still active.

Haines (1951) described the use of untreated material for guinea-pig inoculation and found that this simpler method gave reliable results.

The results of primary culture of the material on Dorset egg and Löwenstein's media were found to be most unreliable. A positive result was significant, but a negative result was of no value whatsoever, and in this series reliance was placed on the results of the guinea-pig inoculations only.

(2) *Type of organism.* The tubercle bacillus was typed, by culture, and if necessary, rabbit inoculation, in all cases with positive animal inoculations and the results were as follows:

Number of positive animal inoculations	27
Number of cases with human type of bacillus	27
Number of cases with bovine type of bacillus	Nil

Very little has been reported in the literature regarding the type of tubercle bacillus responsible for genital tuberculosis in women and this

finding of 100 per cent human-type infection is interesting and rather surprising as, in the course of a recent survey on non-pulmonary tuberculosis by the N.A.P.T. (Wilson, Blacklock and Reilly, 1952), 1,051 strains of tubercle bacilli were examined. Of these, 21·7 per cent proved to belong to the bovine type. In this N.A.P.T. survey 17 cases of abdominal tuberculosis were included and 11 of these were bovine infections, i.e., 64·7 per cent bovine.

Jedberg (1950) typed the bacillus in 178 cases of female genital tuberculosis and found 166 human and 12 of the bovine strain, but stated that it is possible that this frequency of the bovine type has since decreased.

(3) *Bacteriology of vaginal discharge and menstrual fluid.* In 4 cases tubercle bacilli were discovered in vaginal discharge which was examined by fluorescent microscopy using the dye Auramine as recommended by Arens (1949). This method of diagnosis has a useful but limited place in the investigation of female genital tuberculosis.

The menstrual fluid was not cultured in the present series, but, in an endeavour to evaluate the use of this method of diagnosis, menstrual blood was collected from 100 sanatorium patients suffering from extra-genital tuberculosis. This was cultured on Löwenstein-Jensen egg medium and also examined by fluorescent microscopy. Collection of specimens proved difficult without interfering too much with the liberty of the patients and the following simple method was tried. At the commencement of a menstrual period the patients inserted vaginal tampons and when these were well soaked they were placed in sterile containers. In the laboratory about 10 ml. of 4 per cent sodium hydroxide were added to the container which was shaken vigorously. The fluid was decanted off and centrifugalized for 15 minutes. The supernatant fluid was removed and part of the deposit was inoculated on to the egg medium and incubated for 2 months at 37 degrees centigrade. The remainder of the deposit was examined by fluorescent microscopy.

Of the 100 cultures 10 were a total failure owing to destruction of the medium by contaminant organisms. No positive results were obtained in the remaining 90, and in no instances were tubercle bacilli detected by fluorescent microscopy. The examination of the menstrual blood is not considered to be sufficiently reliable for routine use, but with improved techniques may prove to be a useful adjunct to the other methods of diagnosis and assessing progress.

It would appear that any method requiring elaborate preparation of the material undoubtedly devitalizes the tubercle bacillus, and renders its growth difficult.

Treatment

All patients in the present series received their treatment in hospital, although fully ambulant. An endeavour has been made in more recent cases to give treatment as outpatients, but difficulties have been met with in ensuring that the patients attend for full treatment. In-patient treatment is rigidly adhered to, which is important particularly from the point of view of assessing toxic reactions to the drug therapy and for the treatment of co-existent active extra-genital lesions.

Dihydrostreptomycin was used initially and this was changed to streptomycin sulphate after its introduction. P.A.S. was given in doses of 15 g. daily to the first 30 patients, the remaining 6 received 20 g. daily. Patients who remained or became positive again after this treatment were given isoniazid, 100 mg. twice daily for 8 weeks, and these cases are described in more detail below.

The results of pre-treatment curettage and the regular examinations after treatment are summarized in Table II.

Results

Three patients were positive for tuberculosis 3 months after treatment. Two of these cases (Case numbers 4 and 12) received only 30 g. of streptomycin and 450 g. of P.A.S. After a further 60 g. streptomycin and 900 g. P.A.S., the findings became negative and have remained so in both. The third case (Case 3) remained positive for 2 years, until a course of isoniazid was given, and has since remained negative.

One patient (Case 24) became positive 6 months after treatment and was still positive 1

TABLE II

Results of Curettage and Tubal Insufflation before and after Treatment

Case No.	Pre-treatment Curettage		Interval between 1st & 2nd Curettage	Follow-up Curettage Histology and Bacteriology					Tubal Insufflation	
	1st	2nd		3 months	6 months	1 year	2 years	3 years	Before Treatment	After Treatment
1	+	+	5 months	—	—	—	—	—	N.P.	N.P.
2	+	+	10 months	—	—	—	—	—	N.P.	N.P.
3	+	+	2 months	+	+	+	+	—|—	No test	No test
4	+	+	6 years	+	—	—	—	—	No test	P.
5	+	+	6 months	—	—	—	—	—	N.P.	N.P.
6	+	+	6 months	—	—	—	—	—	No test	N.P.
7	+	+	1 month	—	—	—	—	+|—	N.P.	N.P.
8	+	+	14 months	—		—	—	—	N.P.	N.P.
9	+	+	1 month	—		—	—	—	N.P.	N.P.
10	+	+	2 months	—		—	—	—	P.	No test
11	+	+	2 years	—	—	—	—	—	N.P.	N.P.
12	+	+	1 year	+	—	—	—	—	P.	N.P.
13	+	+	1 month	—	—	—	Too ill	+	No test	No test
14	+	+	1 month	—		—	—	—	N.P.	No test
15	+	+	1 month	—	—	—	—	—	N.P.	No test
16	+	+	3 months	—	—	—	—	—	No test	N.P.
17	+	+	1 month	—	—	—	—	—	N.P.	N.P.
18	+	+	2 months	—	—	—	—	—	N.P.	P.
19	+	+	1 month	—	—	+	+	—|—	No test	No test
20	+	+	1 month	—	—	—	—	— (2½)	No test	N.P.
21	+	+	3 years	—	—	—	—	— (2½)	N.P.	N.P.
22	+	—|+	2½ years	—	—	—	—	— (2½)	N.P.	P.
23	+	+	1 year			—	—		N.P.	No test
24	+	+	1 month	—	+	+	+|+	+ (2½)	No test	No test
25	+	+	2 years	—	—	—	—		N.P.	N.P.
26	+	+	3 months	—	—	+|+	—|—		No test	No test
27	+	+	1 month	—	—	—	—		No test	N.P.
28	+	+	4 years	—	—	—	—		P.	P.
29	+	+	6 years	—	—	—	—		N.P.	N.P.
30	+	+	6 months	—	—	—	—		N.P.	P.
31	+	+	1 month	—	—	+|+	—		No test	No test
32	+	+	1 month	—	—	—	—		No test	N.P.
33	+	+	1 month	—	—	—	—		N.P.	N.P.
34	+	+	1 month	—	—	—	—		No test	No test
35	+	+	1 month	—	—	—			No test	No test
36	+	+	1 month	—	—	—			N.P.	N.P.

+ implies tuberculosis present. — implies no evidence of tuberculosis.
+|+ or —|— implies that curettage was repeated in a few months.
N.P. means non-patency of the tubes.
P. implies apparent tubal patency.

year later. Following isoniazid, curettage revealed evidence of endometrial tuberculosis, and positive results again were found 6 months and 1 year after the isoniazid treatment.

Five patients were positive for tuberculosis after 1 year, that is, a failure rate of approximately 14 per cent. Three of these 5 patients had been negative at 3 months and 6 months after treatment.

No patient who remained negative after 1 year was found to be positive after 2 years.

Of the 19 patients followed up for 3 years, 2 cases (Numbers 7 and 13) had again become positive for tuberculosis. This positive finding after a long period of apparently negative results shows that prognosis in these cases must be very guarded, and a prolonged period of surveillance is most essential before assuming that the

tuberculous process has been arrested. It is possible, however, that in some cases the re-appearance of the lesion in the endometrium has been the result of re-infection in a distant focus with subsequent spread to the pelvic organs. The percentage of success and failure of treatment after 1, 2, and 3 years are as follows:

After one year — 36 patients examined
5 positive (14 per cent)
31 negative (86 per cent)

After two years — 32 patients examined
(one defaulter, 1 too ill)
3 positive (9·4 per cent)
29 negative (90·6 per cent)

Two of the patients with negative results had received a course of isoniazid.

After three years — 19 patients examined
2 positive (10·5 per cent)
17 negative (89·5 per cent)

Two of these patients with negative results had also received isoniazid since their examination at 2 years.

Results following streptomycin and P.A.S. only. If the results of treatment with streptomycin and P.A.S. only are considered over the whole period of the series, it is found that 7 of the 36 cases (19·5 per cent) showed tuberculosis of the endometrium after 1 or more years, and 29 (80·5 per cent) showed no evidence of the disease.

In assessing the results of treatment it must be remembered that it is only the endometrium which is being examined and there is no accurate method of assessing the state of the Fallopian tubes, short of performing laparotomy, although decrease in size of adnexal masses has been noted in some cases in the series.

Cases receiving isoniazid

All patients who remained or became positive again for tuberculosis after streptomycin and P.A.S. therapy have been given a course of isoniazid (Cases Nos. 3, 7, 13, 19, 24, 26, 31). Table II provides details of the intervals elapsing before reappearance of the tuberculous lesion in the endometrium of the patients.

Five of the patients had moderate or large adnexal masses, the remaining 2 had slight but definite adnexal thickening.

Four cases have been followed up for 1 year, 3 have remained negative but 1 (Case 24) was still positive 6 months and 1 year after the isoniazid therapy. This patient is now receiving a course of streptomycin, P.A.S., and isoniazid in the hope that the combined effect after a good interval without treatment may lead to elimination of the infection. A further 2 cases have remained negative for 6 months after isoniazid therapy. The remaining case is still under sanatorium care as a thoracoplasty was necessary to control a pulmonary lesion and she has yet to be re-examined.

The period of surveillance in the above 7 cases is not yet long enough to draw any conclusions regarding isoniazid, but the initial results are encouraging, particularly when it is remembered that these 7 cases were all failures with streptomycin and P.A.S. therapy. The high incidence of adnexal masses in these unsuccessful cases is a striking feature, and removal of these masses in selected cases while the patients are under the cover of streptomycin, P.A.S., and/or isoniazid might be indicated to minimize the recurrence of the endometrial infection and aid the eradication of the disease in the pelvic organs.

Isoniazid has undoubtedly a place in the treatment of female genital tuberculosis, and may prove to be a more useful drug than P.A.S. when given in combination with streptomycin. The use of isoniazid alone in the initial treatment of genital tuberculosis is not recommended as drug resistance occurs more frequently than it would if given in combination with streptomycin and P.A.S.

Barns, Smith and Snaith (1953) have, however, obtained moderately good results with the use of isoniazid alone in 32 of their 43 reported cases, although the period of surveillance was short. They added streptomycin and P.A.S. to the treatment of the remaining 11 cases, and the results were not so encouraging as those reported by other workers, but this can probably largely be explained by the inadequate doses of streptomycin and P.A.S. which were used.

Recent personal cases who are having treatment with streptomycin and isoniazid are included in a larger investigation, and are not

described in the present series. A combination of all 3 drugs may prove to be the most effective and is being tried in the one patient in the present series (Case 24) who has so far failed to respond to their separate use.

Improvement in the Clinical Picture after Treatment

There was a marked improvement in the well-being and general health of the majority of the patients after treatment. Of the 15 patients whose main symptom was pain, 11 experienced relief of the pain, and in the remaining 4 pain is still present (Cases 12, 23, 31 and 34). One of these patients (Case 12) developed an acute pelvic sepsis following the last curettage; the infection subsided with antibiotics but signs of salpingo-oöphoritis are still present. Two patients (Cases 23 and 34) had very large bilateral adnexal masses and did not attend when last due to report. The remaining patient still complaining of pain was a failure with streptomycin and P.A.S. therapy and is now receiving isoniazid.

In 24 patients adnexal lesions were palpable prior to treatment and in 10 of these cases there was marked improvement on examination after 2 or more years. In 8 cases, no changes in the adnexal thickening or masses were apparent. In 6 cases the adnexal lesions felt larger, and 2 of these patients (Cases 6 and 7) had developed signs of acute pelvic peritonitis following the initial examination prior to treatment, 1 of them (Case 6) requiring posterior colpotomy to drain a pelvic abscess, the pus from which grew *Bacterium coli* on culture.

Two patients who had no obvious adnexal lesion at the first examination had slight bilateral thickening 2 years after treatment (Cases 25 and 27).

Menorrhagia was present prior to treatment in 8 patients. After treatment the menstrual periods returned to normal in 6 of these patients, and in 2 (Cases 4 and 8) menorrhagia still persisted, although in 1 of the patients (Case 4) the uterus was enlarged to the size of a 10-weeks pregnancy by multiple fibroids.

Of the 4 patients with amenorrhoea, normal menstruation returned in 2, and in the other 2 scanty but regular periods returned.

Tubal Patency before and after Treatment

Tubal insufflation had been carried out in 22 of the 36 cases prior to treatment, and in 19 cases there was apparent non-patency. In the remaining 3 patients tubal patency was demonstrated, but in 1 of these cases tubal insufflation 3 years after treatment showed apparent non-patency on 2 separate occasions. Two or more years after treatment tubal insufflation was carried out in 24 cases and in 19 cases there was apparent non-patency.

Tubal patency was demonstrated in 5 patients (Cases 4, 18, 22, 28 and 30) and in 3 of them apparent tubal blockage had been demonstrated prior to treatment. None of these patients had palpable adnexal masses. In 1 patient tubal insufflation 2 years after treatment had shown non-patency, but after 3 years there was apparent tubal patency.

These findings would suggest that, providing tubal involvement is not severe, there is a distinct possibility of recanalization taking place after some years.

Future pregnancy should be possible in these cases, but so far in the present series no pregnancies have occurred. Kullander (1952) records a case of endometrial tuberculosis treated with P.A.S. with subsequent pregnancy, and Rabau (1952) reported pregnancy occurring after the treatment of tuberculous endometritis with streptomycin, although miscarriage unfortunately occurred at the third month. Barns *et al.* (1953) reported a pregnancy in 1 case in their series who had received treatment with streptomycin, P.A.S. and isoniazid.

No conclusions on tubal patency or occlusion were made on the basis of 1 insufflation. In every instance 2 or 3 insufflations at different intervals were performed as Sharman (1950) has described the possible fallacy of one negative insufflation. Hysterosalpingography was not employed in any case in this series as O'Brien and Lawler (1947) have drawn attention to the dangers of salpingography in such cases.

Complications

During treatment 4 patients developed a generalized dermatitis which was not improved with the administration of antihistamines and

the streptomycin therapy had to be discontinued after doses of 50 to 60 g. had been given. This shortened course has fortunately not affected the apparent success of treatment as all 4 patients (Cases 16, 20, 33 and 36) have since shown no sign of endometrial tuberculosis.

One patient developed severe nausea and vomiting after 10 days of P.A.S. therapy and the drug was discontinued, with relief of the symptoms. Ulnar neuritis, which was attributed to streptomycin, developed in 1 case, and tinnitus and marked giddiness occurred near the end of treatment in another patient. Tests of vestibular nerve function showed marked impairment, but after a course of "Priscol" there has been considerable improvement.

Three patients developed signs of acute pelvic inflammation a few weeks after examination, and before the treatment of the tuberculous lesion had commenced (Cases 6, 7 and 12). They all improved with antibiotic treatment although 1 patient required posterior colpotomy to drain a pelvic abscess. Three years after treatment 1 of these patients (Case 12) had a recurrence of acute salpingo-oöphoritis and pelvic peritonitis following the last curettage. This again settled after treatment with penicillin and sulphamezathine but adnexal masses have become larger than they were initially, although the patient is now symptom-free.

Isoniazid treatment has not been associated with any side-effects in the 7 cases who received 100 mg. twice daily for 8 weeks.

Summary and Conclusions

(1) The investigation and antibiotic treatment of 36 cases of female genital tuberculosis is described.

(2) In every case where a culture was obtained the infection was due to the human strain of the tubercle bacillus.

(3) The attempted culture of menstrual fluid is described.

(4) Over half the cases have been under surveillance since treatment for 3 years, and the remainder for over 2 years.

(5) Of the cases treated with streptomycin and P.A.S. only, approximately 20 per cent have remained or became positive again for tuberculosis, but 80 per cent have remained free from infection, as judged by the histological and bacteriological examination of the endometrium.

(6) Dosage of streptomycin and P.A.S. must be adequate, preferably given for 90 days.

(7) Two patients have become positive again 3 years after treatment, and the necessity for a prolonged period of surveillance is emphasized. Prognosis must be guarded in all cases.

(8) The use of isoniazid is described. A combination of streptomycin, P.A.S. and isoniazid may prove to be of the most value in the routine treatment of all cases.

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VENTRICULAR HAEMORRHAGE IN THE NEWBORN

BY

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HAEMORRHAGE into the cerebral ventricles has been frequently described as a postmortem finding in cases of neonatal death (Capon, 1922; Browne, 1922; Cruickshank, 1930; Rydberg, 1932; Craig, 1938). The reported incidence is said to vary from 16 to 70 per cent of all cases of fatal intracranial haemorrhage. I have been unable to trace any previous report of a case in which the diagnosis was made during life and the infant survived.

CASE HISTORY

Roger A. was delivered after a 6-hour labour in the 37th week of gestation and weighed 5 pounds 12 ounces at birth. His mother suffered from eclampsia and died from malignant hypertension 10 days after delivery. She had previously had 4 normal babies. The infant's condition at birth was satisfactory and the skull circumference was 13½ inches. He fed reluctantly from the start and on the second day had a cyanotic attack from which he recovered following the administration of oxygen. Over the course of the next week he remained apathetic and when seen on the twelfth day his head was noticed to be large and his appearance apathetic. The fontanelle was tense and bulging. The muscle tone was normal and there was no paralysis. Subdural taps revealed no haematoma and it was decided to tap the cerebral ventricles. A dirty, dark-brown fluid was released on both sides. The staining was due to altered blood. The protein content of the fluid from the left ventricle was 625 mg. per cent and from the right 535 mg. Similar fluid was obtained from the cisterna magna. The fluid was sterile on culture and the Wassermann reaction was negative. It was decided to remove as much as possible of the altered blood by performing bilateral ventricular puncture and lumbar puncture on alternate days. This was done for 2 weeks and for the next month the ventricles were tapped twice weekly. The cerebro-spinal fluid removed showed a gradual reduction in pigmentation and in protein content, a figure of 20 mg. per cent being reached at the age of 3 months. At that time ventriculography revealed moderate symmetrical dilatation of both lateral ventricles. At 4 months the skull circumference was 16½ inches.

The baby has been under observation since his discharge from the Neonatal Unit. Owing to the death of his mother he has lived in two institutions. His early development was rather slow and he did not sit up until he was 12 months old. Four months later, however, he was crawling and he commenced to walk at 21 months. It was then noticed that his right leg was slightly weak. He was last seen at the age of 2 years and 8 months. He could then form a four-word sentence, ask for his toys by name and feed himself. His skull circumference was 20 inches, and the right leg was still slightly weak and possibly a little spastic.

DISCUSSION

As the skull appeared normal at birth and as subsequent ventriculography revealed only moderate dilatation of the ventricles, it was considered that this was not a case of haemorrhage into the distended ventricles of a congenital hydrocephalic. The infant resembles the majority of the cases reported in the literature in being premature and in the association with maternal toxaemia. The latter fact is commented on by Cruickshank (1930) and Craig (1938). The clinical picture, however, varies with different observers. Von Reuss (1921) described the affected infants as being apathetic and resembling cases of infratentorial bleeding, with rapid death. Capon (1922) made similar observations. Browne (1922) suggested that it was unusual to have any signs which would localize the injury, cyanosis, anorexia, weak cry and wasting being the predominant symptoms. Craig (1938) described a sudden onset at the age of a week of high-pitched cry and agonized facial expression with rigidity of the trunk and limbs and cyanosis. Similar crises recurred over the course of 2 or 3 days, with a rise of fontanelle tension and twitching. On the other hand 25 per cent of his cases had no signs or symptoms. No explanation has been advanced for the latent interval before the appearance of acute symptoms. It is possibly due to obstruction of the cerebro-spinal fluid pathways by blood and ependymal debris which

have accumulated gradually from slow or repeated haemorrhage.

The haemorrhage has been variously attributed to superendymal bleeding in the drainage area of the striate vein (Rydberg, 1932; Hemsath, 1934) and the choroid plexus (Craig, 1938; Cruickshank, 1930). Von Reuss (1921) incriminates congestion of the straight sinus. An interesting fact is that Palmer (1928) has described ventricular haemorrhage in infants dying before labour commenced. This suggests the occurrence of a direct toxic action on the affected blood vessels under certain conditions.

It would appear that two types of presentation occur, according to whether the ventricular haemorrhage is brisk or slow. Little can be done for the cases of rapid haemorrhage. When bleeding and the development of symptoms are slow it is desirable to remove the irritating fluid and debris in order to prevent or to relieve hydrocephalus. Ford (1926) described plugging of the aqueduct by fragments of brain tissue mixed with blood. Russell (1949) described gliosis of the aqueduct in non-bacterial inflammation of the ependyma, with overgrowth of the subependymal glia. If the aqueduct were to remain unaffected the entry of blood into the cisterna magna could still cause hydrocephalus by producing pia-arachnoid adhesions. This was shown by Bagley (1929) in experiments on puppies. It has also been noted in traumatic cerebral bleeding in older subjects (Moritz and Wartman, 1938; Northfield and Russell, 1939). The satisfactory outcome in the case reported above is ascribed to the early removal of the abnormal ventricular contents.

Summary

(1) The survival of a patient following ventricular haemorrhage is reported.

(2) The diagnosis and treatment are discussed and the literature reviewed.

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MITRAL VALVOTOMY IN PREGNANCY WITH TWO ILLUSTRATIVE CASES

BY

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INTRODUCTION

MITRAL stenosis accounts for approximately 90 per cent of the cases of heart disease in pregnancy, and, whereas the majority of patients go through their confinements without difficulty, there remains a substantial number whose management is not easy. It is felt that any new method of treatment should be given a trial, and it is with this in mind that the operation of mitral valvotomy is being reviewed to see how far it may provide an answer to some of the difficulties that may arise. There has been a number of recent reviews on the subject of heart disease in pregnancy, but only one of these has mentioned the operation of mitral valvotomy (Macrae, 1953), which is a recent development, and it will be many years before the results in general, and in pregnancy in particular, can be fully assessed. The number of operations of this type carried out during pregnancy is very small indeed, and there has been no opportunity for following up results over a long term. Though no dogmatic rules can be laid down about the indications, an attempt will be made in this paper to suggest tentatively the indications for the operation.

HISTORY AND LITERATURE

(a) *Valvotomy*

This operation was first carried out in England in September, 1948, by Brock, who published the results of his first 100 cases in 1952(a). The mortality rate overall was 13 per cent, but was 7·5 per cent for the last 80 cases, due to improved technique. The mortality rate has further decreased over the last 50 cases and it seems likely that the figures will progressively decrease as experience is gained. This rate applied to all ages, but it was found, as a general rule, that the younger patients, below 40 years of age, did better than the older patients. The results also showed that approximately 75 per cent were improved in the first 50 cases, and in the second 50 cases the results are likely to be even better.

(b) *Valvotomy in Pregnancy*

This is an even more recent development, and Brock has, so far, reported only 3 cases, all of which were successful (Brock, 1952b). Logan and Turner (1952) report 2 successful cases and Cooley and Chapman (1952) one.

Mason (1953) has carried out 8 valvotomies in pregnant women of whom 2 died and 6 are alive and improved. The 2 patients who died were operated upon early in the series, and in 1 instance at least the operation was carried out as an emergency measure when all else had failed. In the light of our present knowledge this is not the right way to select cases for operation. The histories of 2 of these patients, upon whom valvotomy has been successfully carried out are reviewed in connexion with this paper.

THE OBJECT OF VALVOTOMY

The object of valvotomy is to increase the cardiac reserve and the exercise tolerance in a patient, and to restore him or her to an active working life.

INDICATIONS

The indications for the operation have been divided into two groups; firstly the general indications, and secondly those indications which may especially arise during pregnancy.

Valvotomy in General

This is a somewhat hazardous procedure and must be employed selectively. Brock has listed certain general principles which are employed in the selection of cases.

The old grading of the New York Heart Association has been used, namely, I, II(a), II(b), and III.

Grade I: Patients with cardiac disease and no limitation of physical activity.

Grade II(a): Patients with cardiac disease and slight limitation of physical activity.

Grade II(b): Patients with cardiac disease and marked limitation of activity.

Grade III: Patients with cardiac disease and unable to carry on any physical activity whatsoever and with distress at rest.

Grades II(b) and III thus present the real problems.

Indications

(*a*) Firstly, the operation should be reserved for severe cases only, and this would imply that the patients should be in Grade II(b) or Grade III. In his series of 1952, Brock carried out only one valvotomy for Grade II(a) disease and none for Grade I.

(*b*) Next, pulmonary congestion and oedema are signs that the stenosis is advanced, and should, as a rule, be treated by operation, but the patient should, in all cases, be tided over the acute attack by medical treatment before operation is carried out. This latter complication can arise very suddenly, especially in the pregnant woman.

(*c*) Thirdly, if the patient has been in failure, especially when associated with orthopnoea, paroxysmal nocturnal dyspnoea, or haemoptysis, indications exist, but the operation should not be used as a last resort for the dying, and medical treatment should again be used in the acute stage.

While discussing indications for operation the question of increased venous pressures on cardiac catheterization is often raised. Though these may confirm a clinical impression, they should not be the deciding factor as to whether or not to operate. This decision should be made on clinical findings supported by X-rays and electrocardiograms.

Contra-indications

There are however, contra-indications, four of which seem most important.

(1) The presence of a gross aortic lesion, the signs and symptoms of which overshadow the mitral lesion.

(2) Gross mitral incompetence with a large heart, again overshadowing the stenosis.

(3) A patient under 20 years of age, in view of the likelihood of the active rheumatic process remaining.

(4) The presence of severe myocardial damage.

These have been especially stressed by Bourne (1952).

Indications in the Pregnant Woman

It is known that pregnancy imposes a strain on a diseased heart, leading possibly to failure to a greater or less degree. The objects of valvotomy in the pregnant state would appear to be as follows:

(*a*) First, to up-grade the maternal cardiac condition, making the rest of the antenatal period less hazardous, diminishing the risks of failure and pulmonary oedema, and simplifying the management of labour.

(*b*) Secondly, to restore the mother to her household, and to her other children in a fitter condition to look after them, by shortening the puerperal period of convalescence, which is often prolonged. It is true that pregnancy may adversely affect the heart for only a short period, and that, once this is over, the cardiac condition will improve in any case, but the cares and worries of a child or a household of children, with inadequate financial support, and little domestic help, may adversely affect the progress, and failure may ensue, largely through social causes. The object of valvotomy in these cases is to ensure that the fittest possible mother shall take care of her house and children.

This particular indication has been sharply criticized by some, but heart disease is a social and domestic problem as well as one for the physician and obstetrician, and, therefore, this indication is relevant.

(*c*) Thirdly, to diminish the chances of failure in a present pregnancy, especially if this has occurred during a previous confinement, or again, to enable a patient who wants more children to have them, though previously she may have been advised against it, for she may be unwilling of her own accord to repeat an unpleasant experience, and short of operative sterilization, all methods of contraception may prove unreliable. The constant presence of the "sword of Damocles" is irksome, and the object in these cases is to remove these barriers, so that valvotomy may mean that the patient can embark upon another pregnancy without fear, while in other instances a patient, who has been advised not to have children, may at last be permitted to have the child she desires.

(*d*) Fourthly, with regard to termination and sterilization, most obstetricians and gynaecologists are reluctant to terminate a pregnancy for heart disease, and still more reluctant to commit the irrevocable step of sterilization. With the advent of valvotomy, it is likely that these two procedures will fall still further into disuse, and be, perhaps, almost entirely discontinued as time goes on.

(*e*) Again, although it has been found that, contrary to the old belief, pregnancy does not influence the ultimate prognosis of heart disease (Bunim and Rubricius, 1948; Haig and Gilchrist, 1949), it is difficult to believe that, if the failure during pregnancy has been very severe, the life of such patients is not shortened, and a valvotomy will favourably influence the immediate, if not the ultimate prognosis.

(*f*) Lastly, it seems probable that, if valvotomy would be considered for a case anyway, the fact that the patient is pregnant should not deter one from operating, but rather that the operation should be carried out without delay, after due preparation, so that she may have the benefit of it to ease the burden of her pregnancy. A long-term policy should be considered, the main object being to restore a fit mother who may continue to look after her family for a longer time.

To summarize, the objects would therefore seem to be:

Firstly to exclude virtually termination and sterilization in rheumatic heart disease in pregnancy, and, furthermore, to simplify the problem of antenatal management, and of delivery.

Secondly, to shorten the puerperium and restore mothers to their homes and families in less time, more able to shoulder their domestic responsibilities.

Thirdly, to make the thought of another pregnancy a less alarming prospect.

Finally, to influence favourably the immediate, and possibly the ultimate prognosis in these cases.

The Risks

There are three which should be discussed fully.

(1) First, the mortality is still considerable (7·5 per cent). It seems, however, that this is decreasing as experience is gained, and that, provided the cases are carefully selected, it will continue to decrease, and, on an average, a pregnant woman, being younger, is more fitted to stand the operation.

(2) Secondly, there is a risk with any operative procedure in pregnancy that abortion or premature labour may take place. So far no cases have been reported, but it is not considered advisable to operate after the 34th week, nor indeed should this be necessary, as the period of maximum load has passed. Nor should one operate before the third month, when the increased burden on the heart has hardly begun and the risk of abortion is greater.

(3) Thirdly, the hazards of anaesthesia may cause the intrauterine death of the foetus, but again, no case of this has yet been reported, and with the enormous improvement in anaesthetic technique it does not seem that the risk is greater to the foetus than in Caesarean section.

Bearing the foregoing generalizations in mind, those who are already in Grades II(b) or III of the disease should be considered as an alternative to termination and sterilization.

Secondly, those who are in these grades as a result of their pregnancy may be suitable, but the mitral stenosis must be the predominating lesion, there being no gross mitral incompetence, with enlargement of the heart, nor any gross aortic lesion. The myocardium should be reasonably healthy, and, above all, there should be no signs of an active rheumatic process.

Finally, those who fail in pregnancy, especially before the 32nd week, need careful consideration. In these cases orthopnoea and paroxysmal nocturnal dyspnoea are particular indications for operating. Especially to be considered are those who have had a history of cardiac failure in a previous pregnancy, and those who have a large family at home, with much housework and worry after they recover, even though they have not failed in previous pregnancies.

These indications must be based on clinical judgment, supported by X-ray and electrocardiographic examinations, while too much emphasis should not be put on the results of cardiac catheterization. In general, it is fair to say that, if valvotomy is considered necessary on general grounds, it should be done notwithstanding the pregnancy, provided there are no obstetric contra-indications. *However, each case must be judged on its merits by the obstetrician, cardiologist, and thoracic surgeon, and each factor carefully considered before embarking upon so great a procedure.*

Illustrative Cases

Case 1

Mrs. A.C. Age 30 years. Para-2

This patient had had a tonsillectomy at the age of 14 for frequent sore throats, but had no history of rheumatic fever. She had been found to have mitral stenosis at a routine medical examination 4 years previously. She had been dyspnoeic for 2 years, and orthopnoeic for 1 year. She had had no haemoptysis but had a dry cough and lacked energy. She had to give up her work as an insurance agent, and could only walk 200 yards along the level without becoming breathless. Her housework was neglected. She was investigated at this time with a view to valvotomy and was found to have mitral stenosis with mild aortic incompetence. This was confirmed by X-ray, which also showed pulmonary congestion, while cardiac catheterization showed slightly increased venous pressures. She was considered suitable for operation, but this was postponed as she was at that time anaemic. She had had 2 children, aged 10 and 6 years, without trouble. She became pregnant again and was admitted to the medical wards in the 24th week of her pregnancy, about 1 year after the previous investigation, having had increasing orthopnoea with 1 or 2 attacks of paroxysmal nocturnal dyspnoea.

On examination she showed the typical mitral facies. She was rather pale with mild orthopnoea and slight cyanosis, and she coughed frequently. There was slight oedema of her ankles, but none over the sacral area. Her tongue was clean and moist. Her pulse was regular in time and force, the rate being 112 beats per minute. Her blood pressure was 135/80 mm.Hg. Examination of her chest revealed an apical presystolic thrill, and her heart showed the apex beat to be in the 5th left interspace, half an inch beyond the mid-clavicular line. Auscultation showed that there was a presystolic mitral murmur, and also an aortic diastolic murmur. The percussion note at the right base was slightly impaired and there were also a few moist sounds at both lung bases. Her abdomen showed that the uterine enlargement was equal to a 24-weeks pregnancy, which corresponded with her period of amenorrhoea. The foetus was palpable presenting by the breech and the foetal heart was clearly heard. The edge of the liver was palpable for 1 finger's breadth below the costal margin. It was slightly tender. Otherwise no abnormal findings were made.

Vaginal examination confirmed the presence of uterine enlargement. The cervix was closed, and clinically the pelvis appeared within normal limits.

Investigations

1. *Blood*—Her haemoglobin was 102 per cent, with 5,310,000 red cells per cubic millimetre. Her white blood cells were 7,900 per cubic millimetre. Her blood group was B. Rhesus positive. The Wassermann reaction was negative.

2. *Urine*—A catheter specimen of urine revealed no abnormality, and there was no growth on culture.

3. *Chest X-ray*—This showed quite marked pulmonary congestion. The heart shadow was increased in size, and there was marked fullness of the left pulmonary artery and pulmonary trunk.

4. *Cardiac Catheterization*—This showed the following pressures:

Right auricle	—	5 centimetres of saline.
Right ventricle	—	31 centimetres of saline.
Right pulmonary artery	—	44 centimetres of saline.
Right pulmonary capillary	—	33 centimetres of saline.

No exercise test was carried out, as the patient was already breathless.

In view of these findings, valvotomy was decided upon. The feeling was that the next 3 months of her pregnancy would be difficult, as she had already had an attack of pulmonary oedema, and this might well occur. With rest and digitalis she would probably go through her pregnancy satisfactorily, but valvotomy would smooth the course, and enable her to mother her new baby and look after her other children much better. Two weeks after her admission she was slightly improved by rest in bed and was transferred to the Thoracic Unit.

Operation

This was carried out on the next day by Mr. G. A. Mason and showed that the medial part of the mitral valve was calcareous, and stenosed. No regurgitation was noted. Her post-operative course was uneventful and she was discharged after 3½ weeks. The pregnancy was progressing normally and she was then no longer breathless nor orthopnoeic. She could do errands round the ward and walk without breathlessness. She had no oedema and her cough had disappeared. Her whole attitude changed from one of depression and resignation to one of alert

cheerfulness. Examination prior to discharge showed that she had no pulmonary congestion. The cardiac murmurs were unchanged in time and character but were much softer.

Progress

The patient was seen regularly at the antenatal clinic, and her progress was maintained. She was readmitted in the 37th week of her pregnancy for observation. A repeat X-ray of her chest showed no congestion. She was allowed up for as much of the day as she wished, and at no time was there any anxiety about her condition. She went into labour spontaneously at 9.00 p.m., 5 days after her estimated date of confinement.

She had a normal delivery after a rapid labour of a living male child weighing 7 pounds 3 ounces. The puerperium was uneventful, and she was allowed up on the 5th and home on the 16th day. Follow-up examination 6 weeks later showed no decompensation and she was able to do considerably more than she could before her pregnancy. She could now sleep comfortably with two pillows at night, and had no breathlessness on ordinary exertion although climbing a hill of moderate steepness caused some dyspnoea. Her feet and ankles did not swell at night. A further follow-up examination was carried out 3 months later and showed that she was still quite well.

CASE 2

Mrs. E.S. Age 26 years. Primigravida

This patient had had rheumatic fever at the age of 7 and chorea at the age of 11 years. She had remained quite well save for occasional breathlessness on exertion for the past 6 years, but 1 month after her pregnancy commenced her breathlessness increased, and soon she could not do any housework or shopping. By the time she was 6-months pregnant she was breathless even at rest, and could not sleep at night without being well propped up. She had a troublesome dry cough but no haemoptysis. An X-ray examination of her chest showed very slight cardiac enlargement and marked hilar congestion, while an electrocardiogram did not reveal any myocardial damage. Cardiac catheterization showed high pressures. Right auricle 9-11 centimetres. Right ventricle 42-49 centimetres. Pulmonary artery 70-73 centimetres. Pulmonary capillary 45-49 centimetres.

On admission to the thoracic surgical unit she looked drawn and anxious and was slightly breathless at rest. Moving about in bed made her very dyspnoeic. She had no oedema. Her blood pressure was 110/70 and pulse 80 per minute, with an occasional extrasystole. Clinically the heart was not enlarged, and she had a harsh systolic murmur at the apex together with an early diastolic murmur. There were some fine crepitations at the right base. Her abdomen showed that she was 6-months pregnant. The foetal heart was heard and there was no albuminuria.

Valvotomy was carried out on the next day by Mr. G. A. Mason, and she was found to have a thin nodular stenosis of the mitral valve with no regurgitation. A good split was obtained. Her post-operative recovery was uneventful and when visited the next day a dramatic change was seen. She was less anxious and distressed, and less breathless. Within a short time she was walking about the ward without breathlessness and was discharged on her 18th post-operative day, and thereafter attended the antenatal clinic. Here she showed no signs of breathlessness and was able to go for walks and do her shopping without difficulty. The pregnancy progressed normally and she was admitted 1 week before term for observation.

She went into labour 2 days after admission and had a normal delivery after a labour lasting 12 hours. A living female child was delivered weighing 7 pounds 8 ounces after an episiotomy, carried out to avoid an impending perineal tear. The puerperium was uneventful and she was allowed up on her 5th and went home on her 16th day. She never at any time showed any breathlessness and was able to look after her baby in the ward as any normal mother. She was seen 6 weeks after her discharge and said she felt well. When asked specifically, she said she felt better than she had done even before she was pregnant, and was able to carry out normal house duties and took ordinary exercise. The child was also very well. Examination of her heart showed that the murmurs were still there, but much softer than before. She was seen after 6 weeks and remained in excellent health.

CONCLUSIONS

The results of valvotomy carried out in pregnant women cannot yet be assessed in view of the recent origin of the operation, but perhaps the following tentative remarks may be made.

(1) Valvotomy during pregnancy, in certain selected cases, has been successful over a short period.

(2) Selection must be very careful and should be made by physician, obstetrician and thoracic surgeon in close co-operation, in view of the hazards of the operation.

I wish to express my thanks for the great help and advice given to me in the preparation of this paper by Dr. William Hunter and Mr. G. A. Mason.

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PRIMARY ABDOMINAL PREGNANCY

Case Report

BY

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PRIMARY abdominal pregnancy is a rare condition, and for this reason the following case is thought worthy of report.

CASE REPORT

A young married woman aged 26 years was admitted to Dudley Road Hospital, Birmingham, at 10.30 p.m. on 1st January, 1951 as a case of ruptured ectopic pregnancy. Three years previously she had a normal delivery at term and the puerperium was uneventful. She had never had a miscarriage and no history of previous abdominal or pelvic inflammation could be obtained. Her periods were regular and normal every 28 days lasting 5 to 6 days and the last normal period started on 22nd November, 1950, that is, 5½ weeks before admission to hospital.

She had been perfectly well until the day of admission at 2 p.m., when she had been seized with severe colicky lower abdominal pain, more marked on the left side. Since then a pain, aching in character, had persisted all across the lower abdomen, and a stabbing pain was felt in the right shoulder on deep breathing.

At 5 p.m., 3 hours after the initial onset of pain, the patient had noticed a scanty vaginal discharge, pink in colour, and this had continued until the time of admission. Her bowels had opened regularly and micturition was normal.

On examination the patient looked pale. The temperature was 98·8° F. (37° C.) by mouth; the pulse was 104 per minute and of good volume and the blood pressure was 110/70 mm. Hg. The urine contained no abnormal constituents. The abdomen was slightly distended and there was tenderness and guarding in both iliac fossae and suprapubically. No tumour could be felt and the intestinal sounds were normal. On vaginal examination the vulva and urethra were healthy. The cervix was softened and mobile but extremely tender on movement. The body of the uterus was anteverted, central in position and of normal size; it was freely mobile but very tender on movement. There was tenderness in both lateral fornices and a tender boggy swelling was felt in the Pouch of Douglas.

A diagnosis of ruptured tubal pregnancy was confidently made and at 11.45 p.m., under general anaesthesia, laparotomy was performed through a midline subumbilical incision. The abdominal cavity contained a large amount of free blood and blood clot. Palpation revealed that the uterus was anteverted, mobile, softened and slightly enlarged. Both tubes and both ovaries felt normal. Each tube and ovary was carefully inspected in turn and found to be normal in appearance. On clearing away the blood in the Pouch of Douglas it was seen that there was a small structure resembling blood clot, about the size of a walnut, attached to the peritoneum over the posterior surface of the uterus, just medial to the uterine end of the left utero-sacral ligament (Fig. 1). Steady bleeding was taking place from this area. Because of the possibility of abdominal pregnancy the small clot-like structure was carefully removed by blunt dissection with the fingers and placed at once in a specimen jar. Bleeding continued from the shallow eroded area remaining at the site of removal. Haemostasis was secured using interrupted catgut sutures and these were inserted with considerable difficulty because of the depth of the Pouch of Douglas. The abdomen was

cleared of blood as far as possible and the tubes and ovaries were again inspected and palpated but found to be normal. The abdomen was closed in layers without drainage.

Blood transfusion was started during the operation and continued afterwards, 1,000 ml. in all being given. The patient's convalescence was satisfactory and she was discharged from hospital on the thirteenth day after operation.

The structure removed from the Pouch of Douglas was a small irregular piece of tissue measuring 3·0 by 1·5 centimetres, and to the naked eye resembled organizing blood clot. On histological examination, however, the specimen consisted of blood clot containing chorionic villi (Fig. 2).

Discussion

Primary abdominal pregnancy may arise when an ovum is expelled from a follicle, becomes fertilized and fails to find its way into the abdominal ostium of a Fallopian tube. If this happens, according to Studdiford (1942), the ovum may embed in any tissue, regardless of its character, with which its blastocyst comes in contact. With the exception of the germinal epithelium of the ovary, such tissue must be either visceral or parietal peritoneum.

For many years it was questioned whether such a sequence of events ever took place. Jarcho (1949) quotes Lawson Tait as saying in 1888: "That a fertilized ovum may drop into the cavity of the peritoneum and become developed there, is a contingency I cannot accept for a moment, for the powers of digestion of the peritoneum are so extraordinary that an ovum, even if fertilized, could have no chance of development", and Bland Sutton (1904) denied that primary abdominal pregnancy ever occurred in women. According to these and other early writers, so-called primary abdominal pregnancy was to be explained by secondary implantation on the peritoneum of an ovum primarily implanted in the tube and then shed into the peritoneal cavity during a tubal abortion. This also was the theory put forward recently by Nicolson (1947) to explain his case which was similar in many ways to the case here reported. However Novak (1947) believes that such a mechanism is incredible as an ovum separated completely from the tube would immediately lose its vitality and therefore become incapable of re-implanting anywhere.

Since Lawson Tait first expressed his views, there have been many cases reported in the literature which would appear to be genuine

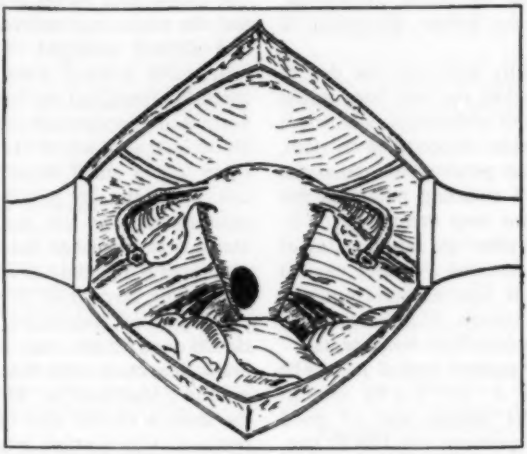

Fig. 1

This shows the site of implantation on the peritoneum covering the posterior surface of the uterus.

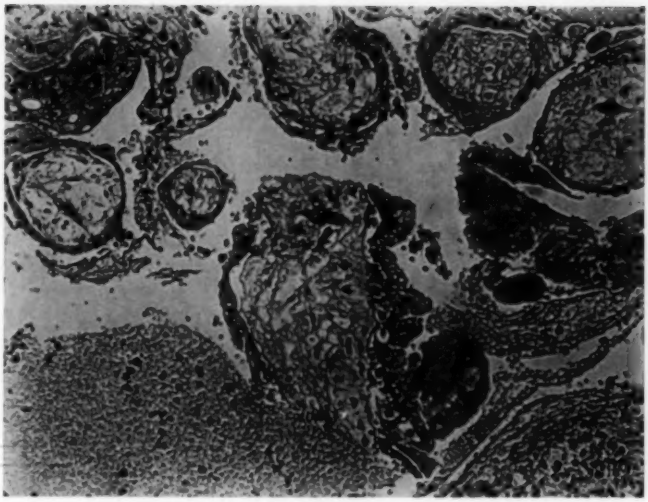

FIG. 2

Photomicrograph of the structure removed from the Pouch of Douglas, showing the presence of chorionic villi and blood clot. ×180.

cases of primary abdominal pregnancy. The first such case was that of Galabin (1896) in a patient who died of haemorrhage and shortly afterwards Witthauer (1903) and Hirst and Knipe (1908) reported further cases. Undoubtedly some of the early cases described as primary were questionable because of the close proximity of the ovum to the outside of the tube. Thus the case reported by Hammacher (1910) is open to doubt as the ovum was implanted on the external peritoneal surface of the right Fallopian tube and may therefore have extended secondarily through the wall of the tube, and the cases of Poten (1924) and of Maxwell, Eastman and Smetana (1927) must be suspect for similar reasons. The modern view, however, seems to be that primary abdominal pregnancy is a definite entity, and this appears to be borne out by many cases in the literature. The cases reported by Williams (1941), Studdiford (1942), Elzey (1948), Bourgeois (1949), Lindemann (1949) and Barbour and Carman (1952) appear to be authentic. It is noticeable that the frequency with which such cases are being reported is increasing, and, as most cases find their way into the literature, it is suggested that the incidence of primary abdominal pregnancy is increasing. Anspach (1933) believes that this is so and that it is related to the increasing incidence of endometriosis. He states: "The frequency of endometriomatous patches on the peritoneal surface and the occurrence of decidual reactions (20 per cent of all pregnant women who came to autopsy, observed by Curtis) of the peritoneum suggests that occasionally such soil becomes available for abdominal pregnancy."

Best (1931) proposed certain criteria for primary abdominal pregnancy and these were recently brought up to date by Studdiford (1942). The latter gives as the criteria on which the proof of a primary abdominal pregnancy must rest as: (1) that both tubes and ovaries are normal with no evidence of recent or remote injury, (2) the absence of any evidence of uteroperitoneal fistula and (3) the presence of a pregnancy related exclusively to the peritoneal surface and young enough to eliminate the possibility of secondary implantation following a primary nidation in the tube. The case here reported satisfies these criteria and is considered to be a genuine case of primary implantation of the fertilized ovum on the peritoneum covering the posterior surface of the uterus.

Acknowledgments

I wish to thank Mr. Wentworth A. Taylor and Mr. Gardiner Mitchell of Dudley Road Hospital, Birmingham, for permission to publish this case. I am also indebted to Dr. A. E. Chaplin, late Assistant Pathologist to Dudley Road Hospital, for providing the photomicrograph.

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VARIATIONS IN THE NUMBER OF ACTIVE PALMAR DIGITAL SWEAT GLANDS DURING THE HUMAN MENSTRUAL CYCLE

BY

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INTRODUCTION

EMOTIONAL instability is a common occurrence amongst women during the luteal phase of the menstrual cycle or more rarely during menstruation itself, and probably accounts for the traditional capriciousness of woman's temper.

This instability is normally transient and may not be recognized, but more severe upsets are complained of, and have been reported as emotional tension (Frank *et al.*, 1934; Stieglitz and Kimble, 1949), psycho-sexual disorders and nymphomania (Gray, 1941), and psychoses; whilst both Cooke (1945) and Morton *et al.* (1952) during an investigation of female prison inmates found that 84 per cent of violent crimes had been committed during this phase of the cycle.

Emotional changes are associated with alterations in sweat activity in certain parts of the body, including the palmar surface of the digits; acute emotion produces an increased sweat secretion (Kuno, 1934), suppressed emotion or states of stress, a decreased secretion (Van der Valk and Groen, 1950).

The object of this investigation was to find any alteration in the activity of the palmar digital sweat glands that might occur coincident with the emotional changes of the cycle in otherwise symptom-free women.

METHOD

Active palmar digital sweat glands in the pad of the right middle finger were recorded daily by 10 unmarried symptom-free women aged 19-22 years over the course of a complete menstrual cycle. The records were taken immediately on waking between 7 a.m. and 9 a.m., at normal room temperature, during February and March, 1953.

The technique used was that described by Sutarman and Thompson (1952). The finger was blotted carefully to remove excess sweat, and a layer of plastic paint applied; this dried within a few seconds and was removed by a strip of Sellotape. The paint held a record of the finger print, active sweat glands showing as "pores" along the ridges (Fig. 1).

Counts of the number of active sweat glands were made under a magnification of 10 in a unit area of 4 square millimetres immediately distal to the central whorl. This area was constantly used because of variation in the number of glands from area to area (Randall, 1946).

RESULTS

Table I contains daily records of the number of active palmar digital sweat glands in unit area of skin for each day of 10 menstrual cycles.

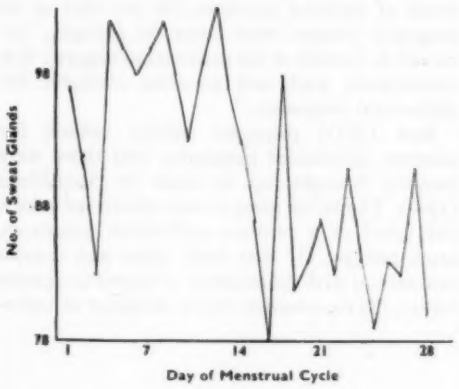

FIG. 2

Average number of active sweat glands for each day of the menstrual cycles.

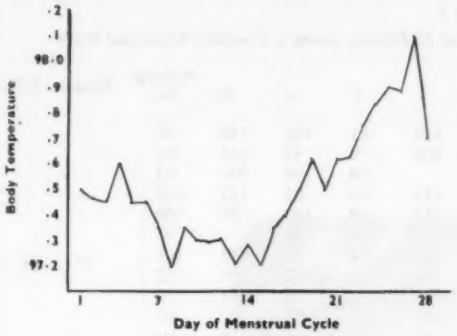

FIG. 3

Average body temperature (Fahrenheit) for each day of the menstrual cycles.

Blank spaces denote days on which counts were missed for personal reasons, and lined spaces days that were outside the limit of the cycle. In addition it contains the average number of active sweat glands for each day of the 10 menstrual cycles, the average number up to the 14th day and between the 14th and 28th day of the cycle and their standard deviations. The table shows a variation in the counts from day to day and between each individual; female No. 1 ranged from 15 to 103, No. 2 16 to 115, No. 3 49 to 90, No. 4 77 to 112, No. 5 55 to 129, No. 6 66 to 103, No. 7 52 to 116, No. 8 50 to 97, No. 9 58 to 106, No. 10 51 to 147, the average count ranging from 78 to 103. The length of the menstrual cycles also varied from 27 to 35 days with a mode of 28 days.

Figure 2 presents in graphic form the average daily sweat gland count during the 10 cycles investigated. Apart from showing a day-to-day fluctuation it shows a fall in the counts after ovulation which is maintained throughout the luteal phase of the cycle. This fall was shown to be statistically "significant" as the difference between the means of the follicular and luteal phases (12) was found to be more than twice the standard error between the means (3·9).

Figure 3 presents the average daily oral temperature during the 10 cycles investigated. It shows that readings were lowest between the 13th-15th days of the cycle and for statistical purposes day 14 was taken as the time of ovulation, the 15th-28th day being taken as the luteal phase.

DISCUSSION

Variations in palmar sweat gland activity from day to day in the same area and under the same conditions are thought to be due to groups of glands working in relays. Individual differences on the other hand are due to a variety of causes, amongst which are varying sweat gland patterns, different ratios of functioning to non-functioning glands (Kuno, 1938) and, no doubt, different levels of emotional activity. Any constant decrease in activity, however, coincident with the luteal phase of the menstrual cycle must be due initially to the cyclical activity of one or other of the controlling hormones.

Oestrogen secretion by reason of its Na and therefore water-retaining properties might effect a decrease in sweat activity (Hemphill, 1942). If this were so, a decrease should be seen at both peaks of oestrogen secretion, not only prior to menstruation but also prior to ovulation.

The constant low sweat level observed throughout the luteal phase is also hard to account for by progesterone secretion which rises from a minimum at ovulation to a maximum immediately before menstruation.

Morton (1950) and Greene and Dalton (1953) have suggested that a raised oestrogen/progesterone ratio with its accompanying water-retention could account for all pre-menstrual symptoms, somatic and emotional; this might also account for a decreased sweat secretion. However, all the women chosen for this investigation were completely symptom-free and had normal temperature curves with no reason to suppose that their hormone secretion was anything but normal. It is also interesting to note that cyclical emotional changes have been noted in hysterectomized and oöphorectomized women (Gray, 1941).

A more likely explanation of decreased palmar sweat secretion and its associated emotional change lies in the cyclical activity of the suprarenal cortex (Bourne and Zuckerman, 1941; Hunt, 1941; Broster and Gardiner-Hill, 1946). It has been suggested that an increased production of corticoids occurs during the luteal phase of the menstrual cycle (Geiringer, 1951;

TABLE I

Number of Active Sweat Glands in Unit Area of Skin of 10 Females during a Complete Menstrual Cycle

Day of Menstrual Cycle	Menstrual Cycles 1	2	3	4	5	6	7	8	9	10	Average No.	Means	S.D.
1	60	98	82	95	122	95	110	81	100	130	97		
2	77	104	75	96	74	92	103	79	97	124	92		
3	94	18	87	91	108	92		50	104	107	83		
4	102		82	81	120	95	116	85	91	142	102		
5	62			112	127	94	115	94	100	99	100		
6	92		90	108	108	97	113	90	86		98		
7	67			85	108	103	116	84	91	144	100		
8	80	102	72	102	129	102	107	85	97	139	102	97	36·8
9	103	106	74	90	110	101	109	70	95	124	98		
10	64	99	72	105		66	101	91	106	147	93		
11			79	103	111	92	97		96	116	99		
12		115	79		117	92		97	88	136	103		
13	74	107	81	101	120	96	95	85	93	124	97		
14	40	97	79	106	128	99	81	86	100	117	93		
15	74	85	74	101	105	97	83	94	69	83	87		
16	66	85	71	81	55	87	101	89	78	71	78		
17		97	74	97	123	100	92	83	96	117	98		
18	24	88	49	96	80	96	97	86	96	105	82		
19	41		86	92	98	94	90	89	103	63	84		
20	58	95	76	89	116	81	90	95	101		87		
21	28		74	110	69	90		77	95	126	83		
22	40		74	78	108	99	105	87	99	126	91	85	20·9
23	39		74	78	61	93	106	86	92	130	84		
24	41	16	79	82	111	93	99	78	58	129	79		
25	36	104	82	89	113	85	107	85	83	51	84		
26	50	54	80	94	121	102	100	78	68		83		
27		79	75	77	104	83	106	80	82	130	91		
28	15	90	76	80	83	89	52	—	93	142	80		
29	—	83	—	84	101	—	—	—	—	—	—		
30	—	95	—	77	110	—	—	—	—	—	—		
31	—	81	—	90	92	—	—	—	—	—	—		
32	—	101	—	—	100	—	—	—	—	—	—		
33	—		—	—	—	—	—	—	—	—	—		
34	—	76	—	—	—	—	—	—	—	—	—		
35	—	87	—	—	—	—	—	—	—	—	—		

MacKinnon, 1953) in preparation for pregnancy, initiated about the time of ovulation possibly by a change in pituitary hormone activity.

Palmar sweat activity is known to be influenced by increased production of corticoids, for a marked decrease is observed in all "stress" diseases (Selye, 1950; Van der Valk and Groen, 1950).

Excitement and emotional tension are also known concomitants of increased corticoid production (Selye, 1950) and may if severe enough lead to psychoses (Sprague *et al.*, 1950). This state might also extend into the early stages of menstruation thus accounting for the occasional cases of tension reported during this time.

Further work is proceeding with a view to deciding whether the emotional change directly affects palmar sweating through the higher centres, or whether it is an accompanying phenomenon due to Na and extra-cellular fluid control by the suprarenal cortex.

SUMMARY

(1) Counts of active palmar digital sweat glands of the right middle finger immediately distal to the central whorl were obtained in 10 unmarried symptom-free women aged 19-22 years during a complete menstrual cycle.

(2) Counts were shown to be significantly

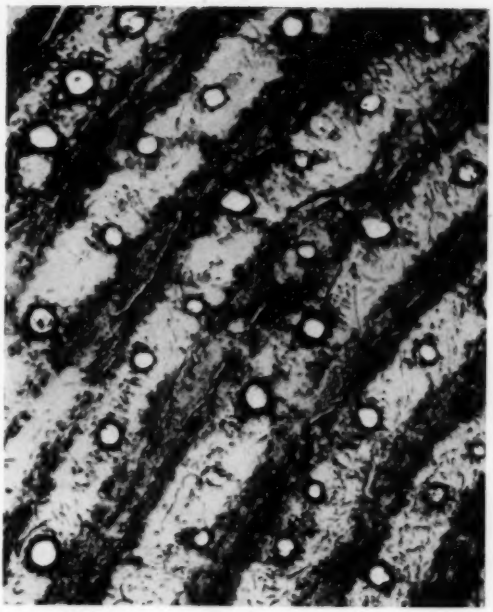

FIG. 1

Plastic impression of finger pad showing "pores" of active sweat glands. ×50.

lower during the luteal than during the follicular phase of the menstrual cycle.

(3) It is suggested that the low sweat gland counts during the luteal phase of the menstrual cycle are attributable to alterations in suprarenal cortical activity.

(4) Emotional changes known to be associated with palmar sweat activity occur during the luteal phase of the menstrual cycle, and it is suggested that these also may be attributable to alterations in suprarenal cortical activity.

Acknowledgments

I wish to thank the 10 students involved in this investigation and Professor E. W. Walls for his helpful criticism. The photograph was taken by Mr. P. Runnicles.

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Obituary

ADAM BARR

M.B., F.R.F.P.S., F.R.C.O.G.

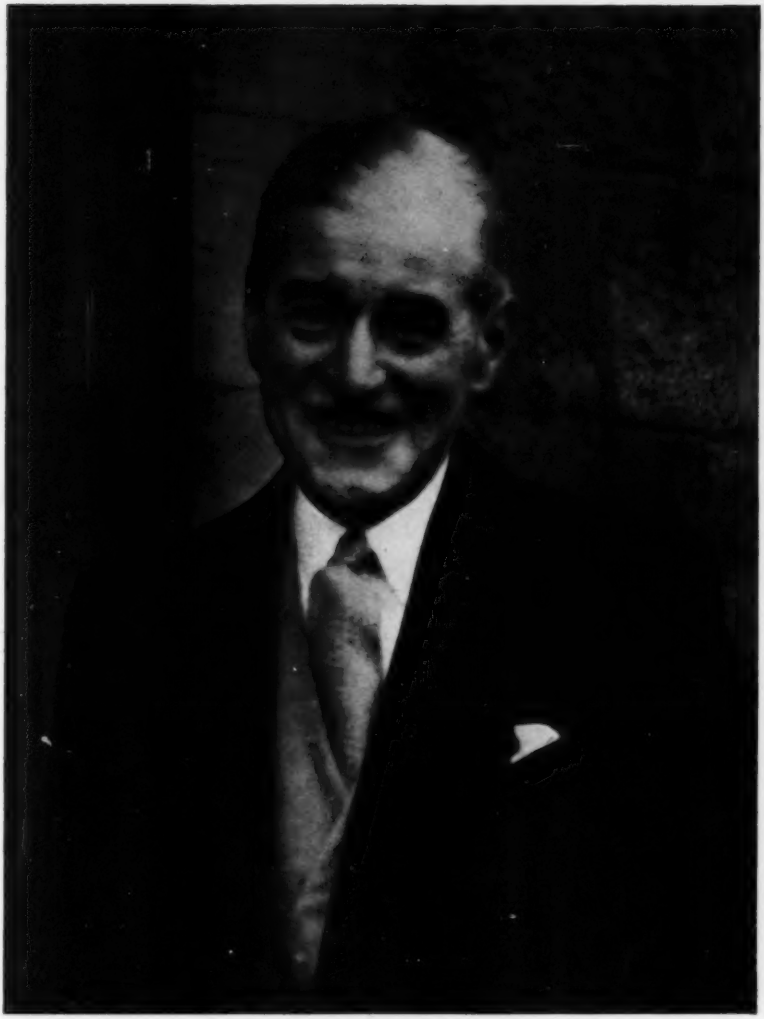
DR. ADAM BARR, senior obstetrician and gynaecologist at Stobhill Hospital, Glasgow, died suddenly on 11th December, 1953, while on his way home from hospital. He was 60 years of age.

Adam Barr was born on 29th May, 1893, at Rutherglen, an ancient royal burgh on the outskirts of Glasgow, and there he spent his student days and the early years of his professional life. He graduated M.B., Ch.B. at Glasgow University in 1921, his medical course having been interrupted by a period of service as a combatant in the first World War. After graduation he held several house appointments and then spent five years in general practice. But he had always been much interested in obstetrics, and as soon as the opportunity offered he joined the staff of the Royal Maternity and Women's Hospital and the Royal Samaritan Hospital in Glasgow. In 1929 he succeeded the late James H. Martin as obstetrician and gynaecologist to the Eastern District, Western District, and Stobhill Hospitals, and while holding these appointments acted for a time as professor of midwifery in the Anderson College of Medicine. He relinquished this post to become senior assistant to Professor S. J. Cameron at the University and at the Western Infirmary. He was elected F.R.F.P.S. in 1926, and two years later he took the diploma of L.M. of the Royal College of Physicians in Ireland. In 1940 he became a Fellow—he was a Foundation Member—of the Royal College of Obstetricians and Gynaecologists.

Some ten years ago he had a serious illness of several months' duration, and accepting this as a warning that he had been overtaxing his strength he retired from private practice, gave up his town house and went to live on a small estate at a convenient distance from the city. In 1949 he further curtailed his activities by resigning from all except one of his hospital appointments. The post he retained was that of senior obstetrician and gynaecologist to Stobhill Hospital, and under his supervision the combined unit there developed into a department of over two hundred beds. Recognizing its importance, the University appointed Dr. Barr an honorary lecturer in clinical obstetrics and gynaecology and arranged that a quarter of the final year students should attend Stobhill for their second course of systematic lectures and for their complete clinical course. This honour was well deserved and was of great significance. It set the seal of university status on the large unit which Dr. Barr had built up from almost nothing, and focused attention on the valuable part he had played in the upgrading of several of the former local authority hospitals. It is only in retrospect that such work can be fully appreciated, and it is pleasing to know that Dr. Barr received recognition during his lifetime for what he had accomplished in this direction.

His other professional appointments included the posts of Examiner to the University, the Central Midwives Board, and the Royal Faculty of Physicians and Surgeons.

Dr. Barr excelled as a clinician and a teacher. His obstetric skill and judgment were of a high order, and he was a swift decisive surgeon. To a greater extent than most people, he relied mainly on purely clinical methods of diagnosis and assessment—not ignoring radiological and laboratory findings, but using them merely as additional sources of information. As a teacher he never forgot that the majority of his students would become general practitioners, and he made it his business to train them as such. His own early experience and his gift of stating the



ADAM BARR

essentials in plain terms enabled him to do this with outstanding success. For the same reason no postgraduate refresher course in Glasgow was considered complete without his lecture on midwifery in general practice. He was regarded as one of the finest teachers of pupil midwives in the West of Scotland, and he was much in demand for special lectures to practising midwives and to those preparing for the Midwives Teachers Diploma. His unit at Stobhill Hospital having six house surgeons and several registrars was a training school for many intending specialists, and in recent years a considerable number of his junior staff have obtained the Diploma or become Members of the Royal College of Obstetricians and Gynaecologists.

It is not surprising that quite early in his career Dr. Barr acquired a very large private practice, which with his hospital work kept him so busy that he had little time for research even if his interests had leaned that way. But his main concern was with the purely practical aspects of his specialty, and his published work deals exclusively with practical matters. Perhaps his most outstanding contribution was the development (in conjunction with Dr. Andrew Tindal) of the Barr-Tindal apparatus for the self-administration of gas and oxygen. Other pieces of work included an investigation into the value of anti-streptococcal serum in the treatment of puerperal sepsis, and the use of "prontosil" in cases of renal infection.

Outside medicine his main pleasures were his love of the countryside and his keen interest in the Church. He was a devout Church member and took an active share in the services and in the social work of the congregation to which he was attached. He was particularly fond of the old Scottish psalm tunes, and when unable through pressure of work to attend a service he used to play over to himself the records of these old tunes as sung by the Glasgow Orpheus Choir. Dr. Barr is survived by his wife, who is also a doctor, and by his only child (a daughter) who is a second year medical student: to them, and to his other relatives, we extend our deep sympathy.

JOHN HEWITT

ROYAL COLLEGE OF OBSTETRICIANS AND GYNAECOLOGISTS

A MEETING of the Council was held in the College House on Saturday, 22nd May, 1954, with the President, Mr. Arthur A. Gemmell, in the Chair.

The following were elected to the Council to fill statutory and other vacancies:

As representatives of the Fellows:

Henry Harvey Evers, Newcastle-upon-Tyne.
Charles Horner Greer Macafee, Belfast.
Thomas Nicol MacGregor, Edinburgh.
William Charles Wallace Nixon, London.

As representatives of the Members:

Ian MacGilchrist Jackson, London.
Robin Murdoch, Glasgow.
James Walker, Aberdeen.

The following were admitted to the Fellowship:

Herbert Agar.
Anthony Francis Anderson.
Alan John Stuart Lawson Boyd.
John Campbell McClure Browne.
James Alexander Chalmers.
Mary Purienkarimpil John.
William Kearney.
Oswald Lloyd.
David Johannes Malan.
Patricia Janet Helen Massey.
George Panton Milne.
Richard Braithwaite Keevil Rickford.
Charles Scott Russell.
John Marshall Scott.
Ruby Grace Sharp.
Arthur Maclennan Sutherland.

The following were admitted to the Membership:

Gordon Todd Dryden Barr.
Edward Rodney Broadberry.
Vivienne Alice Croxford.
Haider Fahmy Daghistany.
Patrick John Dwyer.
Alfred Leonard Tytherleigh Easton.
Jack Raymond Elliott.
David William Somerville Gordon.
Thomas Purdie Grant.
John Greenwell.
Kenneth Greig.
Raymond Wynne Hughes.
George Arnold Humphreys.
Peter Derek Campbell Jackson.
Keith Basil Layton.
Clement Vernon Love.
Arthur Campbell McInnis.
Peter Manolis.
Mrinmoyee Mukerji.
Francis Anderson Murray.
Robert Finbarr O'Donoghue.
George Douglas Pinker.
David Edmund Savage.
Satwant Ganda Singh.
Hugh James Tighe.
John Reuben Dacomb Tomlinson.
Alexander Cuthbert Turnbull.
Rama Vaish.
Peter Sherratt Watson.
Victor Thompson White.

The Council received a further grant of £3,000 from the Leverhulme Trust Fund for research purposes.

List of Candidates who have been awarded the **Diploma in Obstetrics,** March, 1954

Pauline Avery Adams.
David Alexander Aiken.
Douglas James Moffat Allan.
Norman James Wilson Allan.
Gordon Alfred Ames.
William Marr Anderson.
Liselotte Asch.
Swayamprabha Bajpai.
Gerald Stuart Banwell.
Dennis Wilberfosse Barnes.
Rosalind Alethea Barnes.
Margaret Nina Barr.
Mary Malcolm Baxter.
Jean Mary Beecroft.
Elspeth Valentine Beveridge.
Joseph Charles Henry Bird.
William Pollok Black.
Anthony Spencer Blake
Richard Blight.
Max Leonard Bloom.
Frank Philip Brown.
James Weir Browning.
Hilda Marion Brunt.
Marjory Mann Buchanan.
Alfred Myer Burnford.
Nancy Isobel Cardno.
Kim Choy Chong.
Marjorie Coates.
Arnold Cohen.
Thomas Ian Cope.
Charles Eugene Cosgrove.
Mary Gertrude Coyle.
Audrey Noreen Crocker.
Kusum Amerchand Dalal.
Charles Dansie.
Alan Davies.
Jean Margaret Davies.
John Ivor Wynne Davies.
Joan Victoria Davis.
Guy Beaumont Davison.
Vernon Entwistle Dean.
John Yule Newton Devine.
Joseph John Devine.
Robert Daniel Peter Druitt.
Bernard Dudley.
Domnall Duffin.
John Dunlop.
Christopher Plunkett Elliott Elliott-Binns.
John Joseph Enright.
David Lewis Evans.
Mary Eiluned Lloyd Evans.
Jeanette Gaunt Eveson.
Michael Arthur Fenton.
Isabella Croall Ferguson.
Jack Fine.
Alison Mary Madeline Fleming.
Margaret Beatrice Fox.
Mary Ursula Franklen-Evans.
James Arthur Girling.
Ivan Goldman.
John Howard Goode.
Philip Mathews Goodrich.
Peter Dundas Grant.
Elizabeth Donald Grassie.
Hilary Ann Hagan.
Elizabeth Margaret Haines.
Cornelius Joseph John Herlihy.
Keith Malcolm Hewitt.
Frances Mary Hill.
Sheila Henrietta Hoey.
Catharine Elizabeth Hollman.
John Michael Hartley Hopper.
John Houston.
Edmund Howarth.
Tudor Morgan Howell.
Donald Campbell Hudson.
Doreen Rita Hyder.
Sylvia Ray Ingold.
Harry Jackson.
Robert Francis Jackson.
Lelia Jennings.
Ian Mackenzie Johnstone.
Karthigesu Kanagsingam.
Denis Patrick Joseph Kelleher.
Ernest Ignatius Kohorn.
Koussa Tadros Koussa.
Stephen Rea Stuart Laing.
John Samuel Purefoy Lane.
June Patricia Lawson.
William Rimmer Lee.
Peter Angus Lowe.
Gwladys Noeline McCoach.
John Quentin McCubbin.
Jill MacDonald.
Margaret Reid MacDonald McGilvary.
Catriona Douglas McLeod.
Robert Nuttall Malins.
Charles Frank Rex Mallett.
Geoffrey Comins Mansfield.
John Manuel.
Patricia Lilian Martin.
Colin James Grant Menzies.
Barbara Innes Miller.
John Stephen Mitchelson Mitchelson.
Issop Adam Moollan.
Donalda Matheson Morgan.
Mavis Hinemoa Mortimer.
Andrew Lawrence Ian Murphy.
Rathindra Nath Nag.
Terence Michael O'Brien.
John Francis O'Kelly.
Eric Gordon Old.
Chiew Seng Oon.
Elspeth Margaret Orr.

Margaret O'Sullivan.
David Norman Howell Owen.
Neil Stamford Painter.
Charles Eric Parr.
Kenneth Charles Parsons.
Dina Patuck.
Harrihar J. B. Pershad.
William Peter.
Charles Douglas Peters.
Peter Buchanan Poole.
Sylvia Ethel Prebble.
John Fryer Preece.
Wilfrid Edwin Bentley Preston.
Donald Stuart Ractliffe.
Timothy Francis Regan.
Jean Elizabeth Richie.
Kathleen Mary Robb.
Thomas Edward Roberts.
Kenneth Francis Robinson.
Patricia Mary Russell.
Iqbal Sahney.
James Frederick Scarlett.
Roy Schofield.
Albert Schutz.
Francis Geoffrey Maundrell Seager.
Janet Shaw.
Robert Gillies Sinclair.
Gavin Douglas Smellie.
Janet Urquhart Abernethy Smith.
Samuel Alfred Smith.
Carol Mary Somerville Spence.
Timothy James Stanton.
Mary Joan Starbuck.
John Kennedy Steel.
Michael Steele.
David Hamilton Stewart.
Ian Alexander Stewart.
William Michael Brian Strangeways.
Mary Winifred Sturges.
John Stuart Victor Surman.
Muriel Mary Helme Sutcliffe.
William Robert Swaffield.
Gordon Sydney Tapsall.
Malcolm Keith Thompson.
Norman Antony Toes.
Dorothy Iona Troup.
Alistair Glass Turner.
Sam Vakil.
Michael Hadden Vickery.
Jasper de Meillon Vink.
Paul Oasland Wakelin.
Phyllis Margaret Wallington.
Douglas Greig Walker.
Alan Galbraith Wallace.
Iain Hart Watson.
Josephine Patricia Werren.
Susanne Maria Williams.
Arthur Claude Wilson.
Douglas George Wilson.
Guy Cameron Winch.
Hazel Gwendoline Wiseman.
Keith Ashley Wood.
David William Brading Woolven.
Edmund Guy Barker Worthington.
Alwyn Peter Wright.
Malcolm Alan Young.

REPORTS OF SOCIETIES

NORTH OF ENGLAND OBSTETRICAL AND GYNAECOLOGICAL SOCIETY

November 1953

A meeting of the North of England Obstetrical and Gynaecological Society was held in Liverpool Medical Institution on Friday, 20th November, 1953. The President, Mr. D. W. Currie, was in the Chair.

Dr. R. Dowie described

A Case of Jaundice Recurring in Pregnancy

Although jaundice was not a rare disease, said Dr. Dowie, recurrence in successive pregnancies was relatively rare.

The patient, aged 39, was admitted to the General Hospital, Warrington, under Mr. C. M. Marshall, on 17th July, 1951, having that day passed at home a 6-months foetus and placenta.

Twelve years previously she had had a premature labour at the seventh month with the birth of a living child (3 pounds 9 ounces) which was successfully reared at home. During that pregnancy she had developed jaundice at the sixth month which lasted until the 14th day of the puerperium. In 1948, she was treated for ulcerative colitis but had remained well since. The present pregnancy had been normal until 17th June, 1951, when she developed jaundice which deepened until she miscarried 4 weeks later.

On admission the skin and sclera were deeply jaundiced. There was no enlargement or decrease in size of liver or spleen. The uterus was the size of an 18-weeks pregnancy.

The patient was placed on a high protein, fat-free diet, glucose, and full bed rest and her condition improved. The uterus involuted normally, the temperature and pulse rate remained within normal limits, and, by the 8th August, all visible signs of jaundice had disappeared. When seen again on the 18th October, the patient was well and without evidence of jaundice.

Jaundice not uncommonly complicated pregnancy. It might be due to catarrhal jaundice, cholelithiasis, pernicious vomiting, eclampsia, or acute yellow atrophy. It was unlikely that these conditions would cause jaundice complicating 2 successive pregnancies 12 years apart with complete recovery on both occasions and with no attacks of jaundice in the intervening years.

Similar cases had been described by Van de Velde in 1904. He described a case in which a woman had 4 successive pregnancies complicated with jaundice. No live births were obtained and all cases terminated at the sixth month except the first, which went to the eighth month. The jaundice usually disappeared 6 weeks post-partum. Benedict (1902), Becking (1896) and Schaeffer (1902) each described at least 1 case of jaundice complicating pregnancy. Benedict thought the jaundice was due to a progressive cirrhosis of a familial type which progressed with each pregnancy. Schaffer thought it was due to an endogenic toxin but he exonerated the uterus and its contents. Van de Velde agreed that it was probably of a toxaemic nature but ruled out the foetus as the cause.

No definite cause of this disease was found in the above quoted cases and, as none was found in this case, a study of the liver tests might throw light on the subject. Maclagan (1944) used alkaline phosphatase and one of the flocculent tests (Cephalin cholesterol or colloidal gold) for diagnostic purposes. If the flocculent test was negative and the alkaline phosphatase above 35, this was indicative of biliary obstruction. If the flocculent test was positive and the alkaline phosphatase below 25, this suggested a parenchymatous hepatic lesion of toxic or infective origin. Applying these tests to this case, the jaundice present was of a toxic or infective nature. This ruled out Benedict's theory of a progressive hepatic cirrhosis but confirmed the attitude of Schaeffer and Van de Velde. The only infective lesion elicited in this case was an attack in 1948 of ulcerative colitis. This disease can be complicated by jaundice but, as the complication only appeared during pregnancy, it was unlikely that ulcerative colitis was the cause.

Unfortunately, the foetus and the placenta were not available for inspection, so it was impossible to say that they were the origin of the jaundice. The probable solution was that there was a toxic process arising in the uterus and its contents, especially as the jaundice subsided quickly after the expulsion of the uterine contents.

References

Becking, A. G. T. (1896): *Nederl. Tijdschr. Verlosk.*, **7**, 275.

Benedict, H. (1902): *Dtsch. med. Wschr.*, **28**, 296.

Maclagan, N. F. (1944): *Brit. J. exp. Path.*, **25**, 15.

Schaeffer, O. (1902): *Mschr. Geburtsh. Gynäk.*, **15**, 897.

Discussion

Professor T. N. A. Jeffcoate queried the possibility of the jaundice being due to a haemolytic anaemia of pregnancy but Dr. Dowie said that all blood tests were normal.

Mr. G. W. Theobald remarked that in animals a similar picture was seen with malnutrition.

Dr. D. C. A. Bevis described

A Case of Chorionepithelioma

This case was presented, said Dr. Bevis, because the tumour was rare and because in this case it developed in a rather mysterious way.

The patient, aged 44, complained of excessive and prolonged vaginal bleeding. Since the birth of her 2nd child 24 years before, her periods had tended to be heavy but were regular at 28-35 day intervals. About 4 years previously she had missed one or two periods and had some pain in the right lower abdomen and after a few days she began to bleed fairly heavily but lost no clots. She soon began to improve and remained in excellent health with no further pain or menstrual irregularity until about 8 months before this consultation. She then had a period at about the expected time but the bleeding was heavier than usual and, although the loss became less, she insisted that she had bled almost every day for the previous 5 months. During this time she also had some stabbing pain in the right lower abdomen; the bleeding was not related to this pain but became heavier at the times when the periods were expected and this heavier bleeding lasted for the expected time of the periods. Coitus was always associated with an increased blood loss.

On examination she was slightly anaemic but otherwise healthy. Nothing abnormal was found on abdominal examination but *per vaginam* there was slight uterine enlargement with a hard mass the size of a hen's egg attached to the right side of the uterus. The cervix was firm and closed and the appendages appeared normal. He thought the lesion was a fibroid.

At operation a week later the uterus was found to be slightly enlarged with apparently normal tubes and ovaries. But the supposed fibroid was a mass of apparently organized blood clot in the broad ligament. As its pathology was not clear a total hysterectomy with bilateral salpingo-oöphorectomy was performed, care being taken to cut widely lateral to the mass in the broad ligament. The post-operative course was uneventful.

The specimen was examined in the laboratory at Park Hospital, Davyhulme, but as its nature was still in doubt it was further examined at St. Mary's Hospitals, Manchester, by Drs. Langley and Woodcock, who reported as follows:

"Naked eye: Endometrial cavity appears normal. Lt. tube and ovary normal. Rt. tube congested and moderately thickened, slightly bulbous at its fimbriated end which appears closed. Rt. broad ligament covered with adhesions and contains a 3×4 cm. ragged cavity filled with and lined by blood clot and reddish coloured tissue. Rt. lateral wall of the uterus in its outer third contains a 1½ cm. yellowish-red nodule and a 1 cm. red nodule, fairly well circumscribed. Rt. ovary normal apart from a little haemorrhage at its pole adjacent to the mass in the broad ligament.

"Microscopic appearance: Sections from the mass in the rt. broad ligament show blood clot and trophoblastic cells of both Langhans' and syncytial type without formation of villi. Similar cells compose the nodules in the rt. lateral wall of the uterus, with clumps invading the myometrium and tending to cuff the vessels and in some areas projecting into the vessel lumina. Sections of the right ovary show a decidual reaction in the stroma at one pole and hilar cell hyperplasia—the latter feature often to be noted in pregnancy. Several sections of the tubes and the endometrium show no abnormality. The appearances are those of a chorionepithelioma."

The patient had now been followed for 18 months and all Hogben tests had been negative and she showed no evidence of metastasis.

The peculiarities of this case, said Dr. Bevis, were the main site of the tumour and the way in which it arose.

According to Willis (1948) there were two explanations for an unusual site for a chorionepithelioma:

1. The seemingly primary extragenital growth was really a metastasis of a uterine growth that had disappeared.
2. The genuine primary had arisen from deported chorionic elements.

The main tumour in this patient was in the broad ligament and it might well have developed by local embolism in the pelvic veins from the nodules in the lateral wall of the uterus, especially as there were projections into the vessels in the region of the nodules. The site of the nodules themselves was however peculiar as they were very deep to the endometrium which was itself normal. The very prolonged uterine bleeding might explain the disappearance of a primary in the endometrium but the localization of the nodules in the myometrium seemed strange.

The pathogenesis of the tumour was also peculiar. Acosta-Sison (1947) described a case in which a chorionepithelioma arose 3 years after the expulsion of the products of conception but in this patient the only period of amenorrhoea was 4 years before. He was reluctant to believe that she became pregnant during the period of continuous loss that occurred for 8 months before operation as, in spite of repeated questioning, she insisted that the bleeding was continuous. Recently, Langley, Smith and Woodcock (1953) had described a tumour resembling a granulosa-cell tumour which arose in the uterine wall of a woman aged 60; they explained this by recalling that the uterus and ovary arise from the same mesenchymal Anlage and that, under suitable conditions, the uterine mesoderm might produce a tumour composed of granulosa-like tissue. If this were possible, and taking into consideration that chorionepithelioma might arise in the testis, could this be an explanation of the tumour here?

The slow growth of the tumour and the normal appearance of the ovaries were also points of interest. Fortunately the patient had remained well for 18 months.

References

Acosta-Sison, H. (1947): *Philipp. J. Surg.*, **2**, 240.

Langley, F. A., Smith, J. P., and Woodcock, A. S. (1953): *Acta obstet. gynec. scand.*, **32**, 143.

Willis, R. A. (1948): *The pathology of tumours*. Butterworth, London. p. 986.

Discussion

Dr. W. Hunter recalled that Professor Farquhar Murray had demonstrated to the Society a case of chorionepithelioma in the broad ligament: its origin was tracked down to the interstitial portion of the tube.

Professor A. M. Claye described 6 cases of chorionepithelioma he had seen, in 2 of which there was no

demonstrable involvement of the endometrium. He discussed the reliability of biological tests in the follow-up of cases of hydatidiform mole and he emphasized the difficulty of being sure when radical treatment was indicated. In 3 of the 6 cases he had had serious doubts whether to operate and therefore delayed surgery, fortunately without penalty.

Dr. C. H. Walsh thought that 4 years was not too long an interval between pregnancy and a diagnosis of chorionepithelioma. The malignancy of the growth varied widely. He had seen a chorionepithelioma in the broad ligament following an abortion. The patient died with secondaries in the lungs and vulva.

Mr. G. W. Theobald had never seen a case. When he was in Dublin no case of chorionepithelioma had been seen for 15 years, perhaps because after a mole the uterine cavity was curetted thrice in all in 4 weeks. He had knowledge of one case where the only evidence of the tumour was a tiny nodule near the urethral orifice. The uterus and appendage appeared normal but the patient died with cerebral metastases.

Professor T. N. A. Jeffcoate thought that whether operation was successful or not depended on whether any malignant cells were already beyond the tissues removed. In young women the ovaries might therefore be conserved on general grounds. If the tumour was really malignant, the prognosis was hopeless. He could not understand why patients in whom the endometrial surface was not involved continued to bleed.

Dr. Bevis replied.

Dr. Gladys Kay described

A Case of Procidentia of Many Years' Duration with Multiple Vesical Calculi

Dr. Kay said she was presenting this case because of its interest and because of its rarity.

In the *British Medical Journal* of 23rd October, 1897, Professor William Gardner of McGill College, Montreal, had reported a case of a woman of 73 years with a procidentia of 22 years' duration, giving few symptoms until she had an attack of severe tenesmus. The inflamed protruding mass, when grasped, gave the sensation of a bag of marbles. He removed the calculi, which were of all sizes, from grains of sand to some the size of chestnuts, through a large incision through the anterior vaginal wall and the base of the bladder. The opening was not sutured, but left open for drainage, and irrigation. He did not report whether this incision healed, but the procidentia recurred repeatedly until it was kept in position with a Sims Vaginal Rest and a T-bandage.

In the *Zeitschrift für Urologie*, 1951, Dr. H. Steichele of the Surgical Clinic, Nürnberg, reported a case of total prolapse of the uterus, with 5 stones in the bladder. These he removed through a high incision in the anterior vaginal wall. The prolapse was repaired later.

H. S. Everett in his *Textbook of Gynaecological and Obstetrical Urology* reported how rarely women suffer from vesical calculi as compared with men, probably because blocking of the short female urethra was rare. Calculi usually resulted from the accidental introduction of foreign bodies into the bladder during attempts to procure abortion. Calcium salts were deposited within 3 or 4 days, and radiological detection was thus facilitated. He advised removing vesical calculi through an incision in the anterior vaginal wall, if the stones were too large or too hard to be crushed and removed *per urethram* by an operating cystoscope.

Mr. D. C. Racker, at the Liverpool meeting of the Society 2 years previously, had discussed the obstruction which occurred in the urinary tract from procidentia but did not mention calculi.

Dr. Kay said that she saw the patient, a thin, little, old lady of 76 years, on February 6th, 1953. She had had 5 normal deliveries. She had always enjoyed good health, and had never had a day in bed except after her confinements. She had suffered from a complete procidentia for 30 years, but had said nothing to anyone about this, until 3 days previously, when she had severe pain with incontinence of urine, thick with pus, and severe pruritus. She admitted that she had suffered from frequency, and scalding micturition for the past 6 months.

On examination, the procidentia was acutely inflamed and septic, and the pruritus was widespread. The prolapse appeared to be complete, though examination was difficult on account of the severe tenderness. It felt hard and oedematous and pus was pouring from the urethra.

After some persuasion, the woman was admitted into Harrogate General Hospital on 10th February, 1953. Her temperature and pulse rate were normal. Her blood pressure was 180/80 mm. Hg, and her blood urea 75 mg. per cent. The haemoglobin level was 58 per cent.

With rest in bed and injections of penicillin, the inflammation subsided and a hard irregular mass was palpable, and at first this was thought to be due to some fibroids in the uterus, but her house surgeon, perhaps with a heavier hand than hers, said it appeared to rattle. It was impossible to replace the mass in the vagina.

A catheter specimen of urine showed a large amount of mucus and pus and some phosphates. Culture showed a growth of *Streptococcus faecalis*. An intravenous pyelogram showed hydronephrosis of both kidneys and ureters, with large calculi in the bladder but none in the ureters or kidneys. Two pints of blood were given to the patient who was also given chloromycetin, 500 mg. 6-hourly for 2 days.

Eventually she had persuaded the old lady to consent to an operation but she was convinced that this was her end. On February 22nd, 1953, under an anaesthetic of Penthothal, gas and oxygen, a vertical incision 3 inches long was made through the anterior vaginal wall. The vaginal mucous membrane was separated from the bladder and held apart with a retractor, and a transverse incision made through the bladder allowed the extraction of 4 large calculi. The bladder was irrigated with a weak solution of sodium bicarbonate and sodium citrate. A De Pelzer catheter was inserted to control the haemorrhage and to facilitate irrigation, and the bladder incision was closed from both sides with interrupted sutures of No. 1 catgut. The sutures did not include the mucous membrane.

The vaginal wall was sutured from below upwards

towards the urethra with interrupted sutures of No. 2 chromicized catgut and a Foley's self-retaining catheter was inserted through the urethra; the procidentia was then replaced.

The patient's condition after operation caused no anxiety and the De Pelzer catheter was removed the next day as the haemorrhage was negligible, and it was thought that the bladder wall would heal more satisfactorily without the presence of a foreign body. Streptomycin 1 g. was continued for 5 days. Continual drainage of the bladder was maintained through the Foley's catheter by means of a small electric pump by the bedside and the urine gradually became cleaner.

A month later, on 25th March, 1953, methylene blue solution was injected into the bladder through the catheter but no leakage was seen and the bladder wound was found to have healed completely. The anterior wall was firm and no noticeable cystocele was seen. The urethra was very lax and there was some leakage of urine around the catheter. A posterior colpo-perineorrhaphy was performed. Continual drainage of the bladder was maintained for 4 days and then intermittent drainage for 6 days.

The catheter was then removed and the patient allowed to get up and gradually walk about in the ward. Complete control of the sphincter was eventually obtained and had been well maintained ever since, and there had been no recurrence of the prolapse.

In conclusion Dr. Kay emphasized four points:

1. The rarity of vesical calculi in cases of complete procidentia or in cystoceles, although in both there were pockets of residual urine.
2. The crossing of the incisions in the anterior vaginal wall and bladder—a technique also useful in the repair of fistulae.
3. The hydronephrosis and dilatation of the ureters, which was probably present to a varying degree in all cases of uterine prolapse.
4. The supreme importance of good nursing care.

It was worth operating on these old ladies; they stood the operation extremely well and the relief they obtained was immeasurable.

Discussion

In the subsequent discussion there was general agreement that vaginal cystotomy afforded the best approach to vesical calculi in women and Dr. E. A. Gerrard remarked that the vaginal incision healed well even if not sutured. The President remarked that in one case where the urethra had been dilated to allow removal of the stones that way, the patient was subsequently incontinent. Dr. E. Rawlings recommended the use of a metal catheter passed *per urethram* to sound the stones. Dr. H. Roberts demonstrated that urinary stasis in prolapse was due to 3 factors, kinking of the urethra at the triangular ligament, hypertrophy of Mercier's bar, and pouching of the dependent portion of the bladder. The detrusor muscle hypertrophied in an attempt to overcome this stasis but this might be insufficient.

Dr. A. P. B. Harston delivered a short paper on

MITRAL VALVOTOMY IN PREGNANCY WITH TWO ILLUSTRATIVE CASES

(This article appears on page 382 of this issue)

Discussion

Mr. C. J. K. Hamilton described a case where mitral valvotomy had been performed in desperation. The patient had improved but went into labour 2 days later and died. Autopsy showed active rheumatism.

Dr. R. Newton said he had seen cases demonstrated in Edinburgh where the particular surgeon had an operative mortality of only 1·5 per cent. It was surprising how quickly women with cardiac disease deteriorated after the onset of pregnancy.

Dr. C. H. Walsh described 5 cases which had been operated on by Mr. Ronald Edwards at Broadgreen Hospital. In one, in whom valvotomy was performed at 28 weeks because of acute pulmonary oedema, labour commenced the next day. The baby was stillborn and the mother died. In another, operation at 30 weeks precipitated the onset of labour and the baby was lost. In the other 3 the results had been very good. This emphasized the importance of the careful selection of cases for operation.

NEWCASTLE-UPON-TYNE OBSTETRICAL AND GYNAECOLOGICAL SOCIETY

DECEMBER 1953

A meeting of the Newcastle-upon-Tyne Obstetrical and Gynaecological Society was held in the Newcastle General Hospital on Friday, 18th December, 1953. The President, Dr. Hendry, was in the Chair.

Mr. Stewart Feggetter read a paper on

SOME ASPECTS OF NEONATAL SURGERY

Surgery in the neonatal period, has, until the last 10-15 years, often had rather disappointing results, but during recent years considerable improvement has taken place. The improvement can be ascribed to a keener interest being shown in the surgical disease of the small baby, to more skilful diagnostic methods, a clearer appreciation of the symptoms and physical signs, to the introduction of the antibiotics and similar drugs, to better anaesthesia and perhaps most important of all, to methods of overcoming dehydration. Dehydration was the commonest cause of death in the surgery of 20 years ago.

The effects of all these advances, applied to the surgery of the newborn, have resulted in a striking improvement in the treatment of the three principal types of developmental defect which show themselves during the first few days of birth. These defects are:

(1) Exomphalos.
(2) Imperforate anus.
(3) Atresia of the intestine.

EXOMPHALOS

This is an obvious condition, easily recognized, and quite distinct from an umbilical hernia. It is really a

hernia of the abdominal viscera into the umbilical cord so that the contents are covered by a thin translucent membrane, composed of amniotic membrane on the outside and peritoneum on the inside. These two membranes are closely fused together. The condition is due to a developmental defect about the 10th week of foetal life. From the 6th-10th weeks of foetal life the coelomic cavity has a forward extension into the base of the umbilical cord due to the abdominal viscera growing at a faster rate than the peritoneal cavity. After the 10th week the peritoneal cavity enlarges and the viscera are withdrawn into it. If the peritoneal cavity fails to grow at this more rapid rate an exomphalos may result.

They vary considerably in size and may contain nearly all the abdominal viscera in some cases, while in others the contents may be limited to only a portion of the small bowel. The cord is attached to the apex and extending over the translucent sac the umbilical vein and two umbilical arteries can be seen. The skin usually stops at the base of the sac but may extend forwards in some cases as much as ½ an inch or more. The sac wall is moist at first, but soon tends to dry and shrivel up resulting in rupture and escape of the contents.

The treatment of the condition should be regarded as an acute emergency.

The principles of the surgical operation are:

(1) Remove the sac.
(2) Reduce the contents.
(3) Repair the abdominal wall.

(1) *Removal of the sac.* This is removed so that a margin of skin is removed with it. While this is being done, care is taken to identify and ligature the three vessels—umbilical vein and 2 umbilical arteries.

(2) *Reduction of contents.* This may be quite easy, but in some cases where delay has occurred adhesions form between the intestine and the sac wall and sometimes between individual loops of bowel. These should be separated where feasible, but, if damage to the bowel results while stripping off the membranes, part of the latter may be left attached to the bowel.

Sometimes in very large sacs, where the liver is present, great difficulty is experienced in attempting to reduce the contents and pressure effects may result. It has sometimes been helpful in these cases to make counter incisions in the abdominal wall.

(3) *Repair of abdominal wall.* This is done in layers—peritoneum, recti muscles and skin. Where the exomphalos is very large I have occasionally been compelled to do the operation in stages. At the first attempt only the skin is sutured, making no effort to suture the recti muscles. Two or three months later the peritoneal cavity will have enlarged and at a second operation the complete repair is carried out.

Imperforate Anus

The second group of cases which often exercises one's surgical ingenuity is that of imperforate anus. This defect is quite obvious on a very superficial examination, but it is surprising how many of these patients are still admitted to hospital as cases of intestinal obstruction of unknown origin.

The condition is due to imperfect development about the 7th-8th week of foetal life. At the 5th week a cloaca is present, common to both the urogenital and intestinal systems. By the 7th week the cloaca becomes separated into a dorsal and ventral part by a downgrowth—the urorectal septum. The dorsal portion forms the rectum. A depression called the Proctodeum forms on the external aspect, but the rectum is still separated from the exterior by the proctodeal membrane. This ruptures about the 8th week and the rectum now communicates with the exterior.

From this complicated development many anomalies may result. The commonest types of imperforate anus are either the presence of a membrane or the rectum ending blindly some distance from the anus.

The symptoms of the condition are either the non-passage of meconium or those of acute intestinal obstruction. The local signs are either the presence of a membrane or a dimple at the site of the anus. The diagnosis is sometimes helped by an X-ray of the baby in the inverted position, a marker being placed over the anus. The gas in the rectum is seen and its distance from the marker will indicate the extent of tissue separating the blind end of the rectum from the exterior.

The treatment varies with the anatomical type. Where a membrane is present a cruciate incision is all that is required. Where the rectum ends about half an inch to an inch from the anus an antero-posterior incision is made over the site of the sphincter; this is deepened and the external sphincter split. The blind part of the rectum is identified, dissected free from the surrounding tissues, brought down through the two halves of the sphincter and sutured to the skin of the anal margin. In cases where the rectum is higher it is better to do an abdomino-perineal operation. Through the abdomen the rectum is freed in the pelvis. If a fistula connecting the rectum with the bladder or urethra is present, it is separated at the same time. Having freed the rectum an incision is made in the perineum and the rectum guided through to be sutured to the skin.

Atresia of Intestine

The most interesting group of cases which occur in the neonatal period are those of intestinal atresia and since 1939 I have operated upon 35 of these cases. It is on the whole, a rare anomaly, but one is led to believe that it is more common than is realized. There are two groups of these cases—those of atresia where there is complete interruption to the lumen of the bowel and those of stenosis where the obstruction is incomplete. In actual practice the stenosis is often so minute that the symptoms are indistinguishable from atresia. It is, therefore, more convenient to group them together. The origin of the condition is due to the manner in which the bowel develops. Prior to the 5th week of foetal life, the intestine has a lumen lined with epithelium. The epithelium proliferates and the lumen becomes obliterated. Later vacuoles appear and the coalescence of these vacuoles leads to the restoration of the lumen. Any arrest in development about the second month may result in one of these defects of the bowel. The atresia of the intestine may occur either as a diaphragm across the lumen of

the bowel; or there may be two blind ends united by fibrous tissue; or some considerable distance may separate the two ends. The proximal end becomes greatly dilated and is liable to necrose and perforate. The distal end remains minute and unexpanded.

The symptoms of the condition are early and persistent vomiting and the vomit is nearly always bile-stained because the atresia is below the entrance of the common bile duct. They may pass some meconium but little else.

Atresia of the duodenum usually shows some upper abdominal distension with occasional signs of visible peristalsis, but again there may be surprisingly few physical signs. Atresias of the jejunum and ileum show early signs of acute intestinal obstruction—vomiting which may become offensive, distension with ladder pattern and visible peristalsis.

The diagnosis is confirmed by an X-ray examination. Often all that is required is a flat X-ray which will show the gas limited to the stomach and duodenum and none beyond. A barium meal, using thin barium, will make the diagnosis certain. No ill effects have occurred in any of the 35 cases where thin barium was used.

The treatment of the condition is surgical. Delay in treatment is fatal. They are usually thin shrivelled, dehydrated babies. The dehydration must be overcome by suitable intravenous fluids. When fit, the abdomen is explored. For the duodenal atresia, I have usually employed a midline incision and done either a posterior gastroenterostomy or a duodeno-jejunostomy. In a recent follow-up it was found that both methods had been equally successful; 17 cases were operated upon and 12 survived.

In cases of atresia of the jejunum or ileum the only treatment is a lateral anastomosis, but the technical difficulties of anastomosing a very dilated proximal end to a distal undilated end remain the chief obstacle to success. Out of 10 cases of atresia of this part of the intestine, only 3 survived.

Atresia of the colon is exceptionally rare. I have only had 1 case during the last 14 years and it came under my care only two months ago. The baby was admitted with a history of vomiting from birth. The vomit was bile-stained. He had passed no meconium or faeces, he had general abdominal distension and on rectal examination there appeared to be some obstruction to the finger about 1½ inches from the anus. A barium enema showed that the rectum came to an abrupt termination at the pelvic colon.

Through a left paramedian incision the site of the atresia which was just above the pelvirectal junction, was demonstrated. There was the enormously distended proximal end with a minute unexpanded lower portion. In view of the poor state of the child, I did a transverse colostomy. A month later I by-passed the atresia of colon by a lateral anastomosis. Shortly after this, the child developed acute intestinal obstruction which was due to the small bowel becoming adherent to the colostomy. This had to be freed. Following this a faecal fistula developed, which required resection and anastomosis. Finally the colostomy was closed. The child is now fit and well.

Dr. T. G. Robinson read a paper on

A Case of Infertility

The patient, a woman aged 43 years, was admitted to hospital on account of severe dyspnoea; she suffered from tuberculosis and had had a thoracoplasty many years previously. On examination she was found to be 24-weeks pregnant, her first pregnancy after 20 years of marriage. With medical treatment her condition improved steadily and she was subsequently delivered, by Caesarean section, of a live child weighing 4 pounds. Dr. Robinson pointed out that the patient had decided, many years ago, that she did not wish to have any infertility investigation; when she was told of the pregnancy in hospital she was delighted and after delivery of the child she made an excellent mother.

Dr. Robinson compared this case to the present-day tendency for childless parents to have numerous investigations carried out. He felt uneasy about many of the investigations which were now advocated and was strongly against communication of any findings to the patients. He could see no purpose in performing semen analyses as there was no satisfactory treatment for defective spermatogenesis. Hysterosalpingography, he believed, carried risks for the patient and was of doubtful diagnostic or therapeutic value. Endometrial biopsy with histological proof of ovulation did not prove that an ovum capable of fertilization had been produced. It was Dr. Robinson's belief that all the modern infertility specialist could say to his patient after he had done his hysterosalpingograms, his endometrial biopsies and his spermatozoon counts, was "if I have not injured you in any way by my investigations, you are just the same as when you first consulted me". He believed that the risk of injury was not insignificant and that, if efforts were confined to clearing up gynaecological pathology such as cervical erosions, fibroids, etc., and little more than cervical dilatation was performed, more pregnancies would result.

He felt that infertility clinics were psychologically bad for patients and there was a tendency for the doctors who worked in these clinics to lose their sense of proportion.

Mr. Stabler agreed with most of the opinions expressed by Dr. Robinson and described to the Society the reactions of a particular husband to the knowledge that he was subfertile; this patient had been told by the doctor at the infertility clinic that he was "subfertile". Following this disclosure the man had committed a certain offence and had been sentenced; the man had not previously been in trouble.

Dr. J. K. Russell agreed with many of the points raised by Dr. Robinson but he believed that the present tendency to ridicule work done at infertility clinics was ill advised. The childless couple had a very important problem and much depended on the manner in which their case was handled. When the problem was investigated as a combined one, affecting husband and wife, and when discretion and tact were used in the clinical management of the case, the couple would face the future with greater understanding and assurance. With less skilful handling of the problem there was a grave risk

that much unhappiness might be brought to the marriage. Dr. Russell suggested that the clinical approach to the childless couple merited more careful study than it had hitherto received.

Dr. David Millar read a paper on

THE SIGNIFICANCE OF JAUNDICE IN PREGNANCY

In the 5-year period from January, 1946, to December, 1950, there were 17 cases in which jaundice was recorded as occurring during pregnancy, at the Princess Mary Maternity Hospital, Newcastle-upon-Tyne. During the same period the total number of women delivered was 9,782, thus giving an incidence of jaundice occurring in pregnancy as 1 case in 576 deliveries or 0·176 per cent.

In this small series there were 3 maternal deaths and so the overall maternal mortality was 19·5 per cent. All these deaths occurred later than the 31st week of pregnancy.

In 5 patients the jaundice was the result of infective hepatitis. The incidence of infective hepatitis in pregnancy in this hospital was therefore 1 case in 576 deliveries or 0·05 per cent, a figure considerably in excess of the usually accepted incidence. In these 5 cases there was 1 death—the result of acute yellow atrophy. One patient went into labour spontaneously at 36 weeks and was delivered of a stillborn infant weighing 3 pounds 15 ounces.

In 8 cases the jaundice was the result of prolonged vomiting and they could be sub-divided into two groups. In the first group hyperemesis gravidarum was the cause and in the other the jaundice was the result of a urinary infection. It is reasonable to assume that in these cases the jaundice is produced by a dietary deficiency, this being aggravated by the pregnancy.

Five patients suffering from hyperemesis gravidarum became jaundiced out of a total of 120 cases treated for that condition during the same 5-year period. All these patients were admitted to hospital between the 9th and 16th weeks of pregnancy having been vomiting for at least 3 weeks. There were no maternal deaths. Only one therapeutic abortion was performed; the remaining pregnancies continued normally.

In 3 patients the jaundice was the result of prolonged vomiting which in turn was due to a urinary infection. All these patients were admitted to hospital in late pregnancy—from the 31st to the 38th week. They had been vomiting for between 3 and 12 weeks. There were urinary symptoms in only one patient. There were no maternal deaths or stillbirths and all the patients improved rapidly with suitable treatment.

Three cases did not fit into either of the two previous groups. In one patient the jaundice was the result of an incompatible blood transfusion given elsewhere; this patient died on the twelfth day.

In one patient the cause of the jaundice most probably was a severe pre-eclamptic toxaemia. The patient recovered rapidly but during her stay in hospital was transfused with one pint of plasma. Four months later the patient was admitted to the Royal Victoria Infirmary, Newcastle-upon-Tyne suffering from a mild recurrence of her jaundice and this was thought to be the result of a mild attack of homologous serum hepatitis.

In the final case no exact diagnosis could be reached even after autopsy but the most probable cause of her jaundice was Weil's Disease.

The records of labour are available for 10 patients; this showed a tendency for the patients to go into premature labour at the height of the illness; altogether 4 patients did this. In 5 cases (50 per cent) the post-partum loss was abnormal although in only one case was it severe enough to justify blood transfusion.

Four out of 14 infants were stillborn, thus giving a still-birth rate of 28·5 per cent, the significant cause in each case being prematurity. There were no neonatal deaths.

Seven infants (50 per cent) weighed less than 5½ pounds at birth.

None of the infants showed jaundice or other signs of liver disease. One of the infants was found to have a micro-ophthalmic right eye with a corneal scar. The latter condition was judged to have been the result of intra-uterine inflammation.

In this small series of cases it is impossible to draw any firm conclusions regarding treatment. In the last 2 years of the series, however, the medicinal treatment was by the infusion of a polyvitamin preparation supplemented by suitable antibiotics as described elsewhere by Dr. Latner. It may be significant that during that time there have been no deaths. From these results it would not appear that jaundice in itself constitutes an indication for the termination of pregnancy.

Mr. Doberman questioned whether dietary deficiency might be a cause of jaundice in pregnancy. He also recalled the case of hyperemesis which had had a termination of pregnancy performed and assured the Society that the case had been discussed at length by senior members of the staff before a decision was made to terminate the pregnancy.

Mr. Linton Snaith agreed that jaundice was seldom an indication for termination of pregnancy. Speaking of the intravenous therapy described by Latner he stressed the risk of infection, especially where the drip had to be continued for several days.

Dr. Millar in reply reiterated his belief that jaundice might develop in the presence of severe dietary deficiency. He apologized if he had given the impression that jaundice was never an indication for termination of pregnancy; such evidence as he was able to obtain from his survey suggested that it was seldom necessary to end a pregnancy because of jaundice.

NORTH OF ENGLAND OBSTETRICAL AND GYNAECOLOGICAL SOCIETY

DECEMBER 1953

A Meeting of the North of England Obstetrical and Gynaecological Society was held in Leeds General Infirmary on Friday, 18th December, 1953. Mr. David W. Currie delivered his presidential address entitled:

VARIATIONS ON THE MANCHESTER THEME

Mr. Currie said that he judged the ability of a gynaecologist by the skill he showed when working not in the

abdomen but in the vagina where he could show his craftsmanship and leave his trademark in the repair of a prolapse just as plainly as an architect could leave a trademark on a building. He believed that there was no more satisfactory operation in surgery than the repair of a prolapse, an operation which, as undertaken today, was perfected in Manchester and which he preferred to call after Fothergill.

He operated on about 10 prolapses per week, but the cure of this condition had never become irksome, for each case was different and with its own peculiarities. He followed the teaching of the late Victor Bonney regarding the principles that should underlie all operations for prolapse. These principles were:

1. Shorten the cardinal ligaments.
2. Narrow the vaginal lumen.
3. Achieve the anteverted position of the body.
4. Bolster or thicken the vaginal walls, front and back.
5. Build up a good perineal body.
6. Narrow the outlet to its original or proportionate size.
7. Preserve or increase the length of the anterior vaginal wall.

As Bonney pointed out, prolapses varied and, although a standard operation would cure in most cases, the surgeon must look for and cure unusual deformities, the most common of which was a pouch of Douglas hernia. Every congenital uterine prolapse was likely to have such a hernia; it was easy to demonstrate and fairly easy to cure. In the current year, 21 per cent of the operations he had undertaken were for previously unsuccessful repairs.

He would touch on only a few aspects of plastic work, all of which were variations on the original theme. He did not claim that he was the designer of these variations, which had materialized from watching other people at work and reading descriptions of operations.

When operating upon a massive procidentia he usually removed the uterus. In a third stage prolapse the vagina turned completely inside out; the cervix had descended some 5 or 6 inches or even more; all the ligaments were grossly overstretched. Removal of the uterus allowed for greater shortening of the ligaments, and, if the two ovarian pedicles and the two cardinal ligaments were joined together, a new shelf could be formed at any position in the pelvis, even as high up as the pelvic brim, and to this could be suspended the vaginal vault. This operation necessitated a complete freeing of the bladder which was then pushed well up so as to carry the ureters out of danger. The ligatures attached to the cardinal ligaments were left long and after being passed independently through the vaginal vault were knotted together, securing the vaginal vault to the newly-formed pelvic shelf.

Vaginal hysterectomy in prolapse, continued Mr. Currie, was sometimes followed by the first appearance of stress incontinence, but this trouble could be avoided by taking care to push the bladder well up, building a sound shelf and making a long anterior vaginal wall. In many women the anterior vaginal wall was smocked and lay in many transverse folds. If all these folds were freed and prevented from re-forming, the wall might be increased in length by as much as 2 inches. He would demonstrate in the film how he obtained this length by using a small needle for the deep mattress sutures under the bladder, thereby wasting only a scanty amount of tissue in the length of the vagina, and by apposing the edges of the vaginal flaps with a series of tissue forceps before the final vaginal sutures were inserted. Just above the urethral opening most prolapses showed a tag or fold of skin, which never had the urethra in it and could therefore be cut away without fear. Many years before Mr. Leyland Robinson had demonstrated to the Society his incision for removing this fold of skin. Mr. William Gough always insisted on removing this "wattle", for he said that otherwise some woman would come back and tell you that she still had a swelling she could feel below and you had not cured her prolapse.

Mr. Currie believed that, after completing the spoke-like stitches used to cover the cervix, anatomical and mechanical results could be improved by the careful insertion of 2 special stitches. The first made a new anterior fornix or a new vaginal cervix. Provided that the bladder had been displaced far enough upwards the upper ends of the vaginal flaps could be stitched down on to the cervical stump. This stitch was inserted, but before it was tied the second important stitch was placed in the deep tissues in such a way that the base and sides of the triangle of the open space became one straight line. The anterior wall was thus lengthened and the cervix pushed higher up the vagina.

For posterior colpoperineorrhaphy he made 2 incisions in the perineum, running from the sides of the vagina back towards the anus. It provided a neater finish and gave a better exposure of the levator muscles. The posterior vaginal wall was freed from the remains of the perineal body to a point well above the bulge of the rectum and then deep stitches inserted to build up a strong wedge-shaped perineal body. Before completing the vaginal wall, he inserted a suture parallel to the cut edge and half an inch below it which would prevent the transverse ridge, a source of dyspareunia, so often found on the posterior wall just inside the vagina. Posterior colporrhaphy was done mainly for cosmetic reasons unless there was an associated rectocoele, for he did not believe that the perineal body supported the bladder or uterus.

Fothergill modified his operation to suit the degree of prolapse. The incisions, beginning as usual in the neighbourhood of the urethra, passed upwards and outwards into the lateral vaginal fornices, but the transverse incisions which joined the two together did not pass behind the cervix but came directly into the cervix at three o'clock and nine o'clock so that only the anterior lip of the cervix was amputated and very little of that was actually removed.

This modification was never recorded by Fothergill himself but was brought to light by Brentnall. He himself had used a similar modification for many years with success; it was the operation of choice in the repair of prolapse in young women. He also used it in the treatment of cystocoele with little uterine descent or little cervical hypertrophy, in the treatment of stress incontinence and in the cure of vesico-vaginal fistula.

Fothergill's modification preserved the length of the cervical canal and partially exposed the cardinal ligaments but would not cure a second stage prolapse. The method he himself used varied in two respects. He removed only the anterior quarter of the cervix and the cuts into the cervix travelled upwards and inwards to join in the region of the external os. To achieve this the bladder was separated from the cervix and the anterior parts of the cardinal ligaments were thus well exposed. When the cut surfaces of the cervix were sutured together, the uterus previously lying in retroversion assumed a position of anteversion which was progressively increased as the deep mattress sutures were inserted and tied and the anterior fornix shaped. In this operation it was essential to insert the mattress suture nearest to the cervix with the greatest care. When this ligature was secured, the uterus is lifted up, the bladder was held above the level of the internal os, and the anterior vaginal wall was greatly lengthened which, in itself, pushed the uterus higher; furthermore the cervical wound could be closed in such a way as to leave an apparently normal anatomical cervix. Seven women followed after this operation had perfectly uneventful pregnancies and labours, although in one a small scar could be felt on the anterior lip as she reached full dilatation. This simple technique could also be applied to relieve stress incontinence. During the last two years he had practically dispensed with any form of sling, even the combined prolapse and sling operation described by him to the Society a short time ago.

He often used this approach in the repair of a vesico-vaginal fistula too. He treated all fistulae through a long anterior vaginal incision, freeing the bladder from the cervix and had even removed the uterus in order to mobilize the bladder adequately. Then and only then was it possible to obliterate the fistula successfully and bury it deep below layers of pelvic fascia and vaginal skin.

Mr. Currie showed a film made by Mr. Hainsworth of the Department of Medical Photography at St. James's Hospital, Leeds to illustrate these various points.

The President was thanked for his address by Professor A. M. Claye (Leeds), Mr. A. A. Gemmell (Liverpool), Dr. J. W. A. Hunter (Manchester), Mr. L. B. Patrick (Sheffield) and Professor H. Harvey Evers (Newcastle-on-Tyne).

NORTH OF ENGLAND OBSTETRICAL AND GYNAECOLOGICAL SOCIETY

JANUARY 1954

The Annual General Meeting of the North of England Obstetrical and Gynaecological Society was held in Manchester on 15th January, 1954. The following were elected officers for 1954:

President—Dr. K. V. Bailey.

Vice-Presidents—Miss K. I. Liebert, Mr. D. W. Currie, Professor Harvey Evers, Mr. J. Hamilton, and Mr. C. R. MacDonald.

Hon. Treasurer—Dr. C. H. Walsh.

Hon. General Secretary—Mr. D. C. Racker.

Hon. Reporting Secretary—Mr. S. Bender.

After Dr. Bailey had taken over the chair from the retiring President, Mr. D. W. Currie,

Dr. William Hunter described a case of

A PELVIC TUMOUR FOLLOWING HYSTERECTOMY

Mrs. E.R., a nullipara 42 years of age, who had had a subtotal hysterectomy with bilateral salpingo-oöphorectomy for uterine fibroids and ovarian thecoma 5 years previously, complained of 2 attacks of rectal pain during the past year. Micturition and defaecation were unaffected. On examination a transversely elongated and somewhat asymmetrical mass was felt, lying above the vaginal vault and inseparable from the cervical stump. The mass was of rubbery consistency and was not unduly tender to palpation.

At laparotomy the mass was found lying immediately behind the bladder. After separation of adhesions the peritoneum was opened transversely along the previous suture line. Two or 3 drachms of thick semi-fluid sebaceous matter escaped from the incision and a considerable quantity of material resembling delicate fragile over-sterilized gauze was removed from a cavity between the bladder and rectum. The cavity was drained into the vaginal vault and the pelvic and abdominal wounds were closed. The bacteriologist reported that the fluid was sterile.

Enquiry revealed that the pelvic wound had been packed after the hysterectomy with Calgitex Alginate Gauze to control venous oozing. He himself did not use absorbable gauze but the leaflet enclosed with the gauze stated that "the bleeding area should be covered with a layer of gauze and firm even pressure applied. The smallest quantity of gauze practicable should be used. Alginate gauze will not be absorbed in areas where there is a poor blood supply, and therefore should not be used to fill a dead space or plug a sinus or other avascular area."

It is almost certain, in view of the quantity of gauze removed, that these criteria were not observed in the case described. It would be helpful to know if others had had similar experiences with the so-called absorbable gauzes which were fairly widely employed.

Discussion

Mr. D. W. Currie had never had occasion to use absorbable gauze, for oozing always responded in time to the application of a hot gauze pack. Three other members however said they had had mishaps with Calgitex and Oxycel gauze.

Dr. K. V. Bailey read a paper on

A CLINICAL INVESTIGATION INTO UTERINE PROLAPSE WITH STRESS INCONTINENCE. TREATMENT BY MODIFIED MANCHESTER COLPORRHAPHY

(This article appears on page 291 of this issue)

Discussion

Sir William Fletcher Shaw, after thanking the Society for the Honorary Fellowship conferred on him that

evening, said that he had investigated more than 800 women after the Manchester operation, in some of whom stress incontinence had persisted afterwards. Nevertheless the diagnosis of stress incontinence depended on the thoroughness of the clinician and he thought that many sling operations had been done for only minor degrees of disability. The Liverpool investigations represented a tremendous advance in pre-operative diagnosis and in post-operative control of results. Dr. Bailey had impressed him by demonstrating in his cases the cause of the stress incontinence and its anatomical cure.

Mr. P. Malpas congratulated Dr. Bailey on his masterly exposition, and on his admission that he had not cured every single case. The pubo-vaginalis muscles had to be tackled from above, for, despite statements to the contrary, they could not be sutured together under the bladder neck or urethra by the vaginal route.

Dr. Henry Roberts said it was a great encouragement to know that the Liverpool views on the anatomy of stress incontinence and its radiographic demonstration had been so amply confirmed in Manchester.

Dr. Bailey replied.

BOOK REVIEW

"Klinische Zytologie." By H. J. STREICHER and ST. SANDKÜHLER. Pp. 195. With 58 illustrations, many in colour. Georg Thieme, Stuttgart, 1953. Price D.M.49.80.

THIS is unlike any other book on cytology written since the publication of Papanicolaou and Traut's textbook *The Diagnosis of Uterine Cancer by the Vaginal Smear*. The authors of this volume, with true German thoroughness, endeavour to give a complete picture of the cytology of the human body. They studied cells from operation specimens, aspiration material from various organs, smears from mucous membranes as well as cells from trans- and exudates.

The book is subdivided into two main sections and an Appendix. Part I deals with general cytological subjects, including a historical survey of cytodiagnosis dating back to 1590, when the microscope was invented, a description of technical methods in use and a discussion of the morphology of normal and pathological cells.

Part II deals with cytodiagnosis and organ cytology. Cytodiagnosis is used in a general sense, the definition being clinical evaluation of individual cell changes. The cytology of every system in the body, including the central nervous system, the bone marrow, the lymphatic system and the spleen, the endocrine glands and the muscular apparatus is discussed in detail. The description of the normal cellular constituents of these organs is followed by an account of pathological changes as caused by inflammatory (specific and non-specific) and neoplastic lesions.

The appendix contains a short summary of technical methods such as means of cell fixation, staining, counting and measuring, optical apparatus and a "short cytological dictionary".

Notwithstanding considerable gaps in present-day knowledge, the book attempts to give the reader a detailed account of the cytological structure of every organ in the body. This is accompanied by the most exquisite coloured drawings and a few photomicrographs. The chapters on the cytological examination of sputum and vaginal secretions, two fields in which the cytological method has proved its value, are regrettably short and give only the barest information.

REVIEW OF CURRENT LITERATURE

CONTENTS

	REF.
ANATOMY	64
PREGNANCY	66
LABOUR	90
ANAESTHESIA	94
LACTATION	99
OBSTETRIC OPERATIONS	103
INFANT	105
GYNAECOLOGY	106
New growths of the reproductive organs	118
Operations	126
Urology	131

ANATOMY

64. The Problem of the Normal Pelvis.

By S. KRUKIEREK. *Gynaecologia, Basel.* **137,** 1-10. Jan. 1954. 17 refs.

The author has studied the "normal" female pelvis and disagrees with the generally expressed view that the normal pelvis has a true conjugate of 11 cm., a transverse diameter of the inlet of 13·50 cm. and an inlet index of 81·48. He contends that the shape of the pelvis depends on racial factors and on living conditions. Thus the findings of Popiel (*Pam. Tow. Lek. Warsz.*, **99,** 169, 1903) showed that the pelvic index in 100 women in 1903 was lower than a series of 150 women examined by the author in 1949. In other words the pelvic index has increased so that there is less tendency to flattening of the pelvis.

The author found that, in 179 female foetuses of a length of 26 to 58·5 cm., the pelvic index was nearly 100, that is higher than in adults; flattening of the pelvis occurs when the infant begins to walk.

It is presumed that the average pelvic inlet index if women lived under ideal conditions would be 95·00.

Josephine Barnes

65. The Anatomical and Clinical Significance of Contracted Transverse Diameters of the Pelvis. (Considérations anatomo-cliniques sur les bassins transversalement rétrécis.)

By E. BANSSILLON, A. NOTTER and P. REBOUL. *Gynéc. et Obstét.*, **52,** 479-481. 1953. 2 figs.

The writers draw attention to the importance of the transversely contracted pelvis which may escape even the mature obstetrician.

They make a plea for pelvimetry in every primigravid woman who has a mobile head at term, and this should include films taken at the level of the superior strait and measurement of the subpubic angle. In the last 4 years they collected 26 cases of this type of contraction out of 9,000 hospital patients. Their definition conforms to that drawn up by Trillat and Boulez in 1936: "The transversely contracted pelvis is one in which the transverse diameters are contracted and the antero-posterior ones are unaltered or increased."

From the point of view of prognosis they define three principle types:

(1) The classical type of transversely contracted pelvis which has the shape of an Easter egg in the antero-posterior X-ray, and shows a satisfactory wide anterior

curve of the pelvic brim, but not infrequently is associated with occipito-posterior positions.

(2) The type which is both generally and transversely contracted but predominantly the latter in which there is a very reserved prognosis.

(3) The transversely contracted pelvis with a poor anterior curve of the pelvic brim—where at least 3-4 cm. of the plane of the brim cannot be used retropubically. The prognosis in this type is almost as bad as in the true flat pelvis. They term this "transversely contracted pelvis with anterior angulation" and it necessitated 1 hysterotomy and 3 very difficult forceps deliveries in their series of 26 cases.

[Illustrations of the films of type 2 and 3 are clearly shown.]

David Maxwell

PREGNANCY

66. **Levels of Progesterone in Systemic Plasma during the First Trimester of Human Pregnancy.**

By D. H. SCHULTZ. *Amer. J. Obstet. Gynec.*, **66**, 1260-1263. Dec. 1953. 1 fig. 25 refs.

Using the Hooker-Forbes technique for direct measurement of progesterone levels in the plasma, assays were done on 34 pregnant women between 6 and 17 weeks after the last menstrual period. Of these 22 went to term, 2 delivered prematurely, and 10 aborted, 9 of them spontaneously. Progesterone was found in the plasma in 10 cases only, and in very small amounts; and as 3 of these were in cases of abortion it is concluded that there is no evidence that abortion is due to deficiency of the hormone.

All investigators have been impressed by the very minute quantities of progesterone detected in the blood of pregnant primates though it is found in large amounts in rats, mice, rabbits and ewes. This is all the more surprising as pregnanediol excretion curves suggested that progesterone levels increase progressively during pregnancy. The low levels in the primates may be due to the progesterone being metabolized immediately after it acts, or it may be that progesterone is less important in human pregnancy than has been hitherto believed.

Until the exact mechanism of progesterone action in pregnancy is known no rational progesterone therapy can be employed in the treatment of habitual abortion.

F. J. Browne

67. **Influence of Weight Gain on Pregnancy: A Review of 1,000 Private Cases.**

By S. A. ALEXANDER and J. T. DOWNS. *Amer. J. Obstet. Gynec.*, **66**, 1161-1167. Dec. 1953. 1 table. 5 figs.

This is a study of 1,000 unselected pregnant women in the middle income group. The diet was high in protein, especially meat, milk and eggs, and starches and fats were added according to the patient's wishes and the rate of weight gain. Salt was restricted according to weight gain or oedema formation. In the event of an excessive or a too rapid gain in weight most patients were put on sharply restricted diets which never furnished less than 1,000 calories.

The mean gain was 17 per cent of initial body weight, the extremes varying from 0 to 49 per cent and from 3 to 69 pounds. The amount of weight gain had no influence on the length of labour and very little, if any, on the development of toxaemia. In the toxaemic group the average gain was 22·4 per cent compared with 17 per cent for the whole series, and it varied from 6 to 40 per cent of initial body weight, and from 8 to 41 pounds.

The authors conclude that 17 per cent of initial body weight, or 20 to 25 pounds, is a normal gain in pregnancy. "Restriction of weight gain to 15 pounds therefore would have little merit; conversely 25 pounds gained throughout gestation should occasion little alarm." Though all the patients with toxaemia had a greater than average weight gain by far the great majority with excess gain did not develop toxaemia. This may be due to the fact that no distinction was made between gain due to oedema and that due to eating habits alone.

F. J. Browne

68. **Preliminary Report on Amino Acids and Serum Protein Variations throughout Pregnancy.**

By L. O. S. POIDEVIN. *Med. J. Aust.*, **1**, 105-107. Jan. 23, 1954.

Chromatography was used in the analysis of amino acids in the urine and serum and paper electrophoresis was used to study serum protein. All the amino acids are expressed in arbitrary figures obtained by assigning a number to each spot on the chromatograms according to the depth of colour produced by ninhydrin.

Patients were studied when not pregnant, in normal pregnancy, in a normal pregnancy when there had been toxaemia in a previous pregnancy, in a toxaemic pregnancy and at all stages of pregnancy.

The work was started in 1950 and this preliminary report covers the first year's work during which time over 100 patients were studied. The work is still proceeding and the final report will include some 250 patients.

During the third trimester of both normal and toxaemic pregnancies, the urine amino acid content rose and the serum amino acid content fell. This could have been due to a fall in the renal threshold. In both normal and toxaemic pregnancies the total serum protein content fell, mainly the albumen fraction. The fall in the albumen content was greater in toxaemic than in normal pregnancies. During normal pregnancy α_1, α_2, and β globulin contents increased in the serum and the gamma globulin content fell. In toxaemic pregnancy the rise in α_1 globulin content was greater and the fall in gamma globulin content less than in normal pregnancy.

All the results are tabulated under the headings of the various amino acids and serum proteins related to the stage in pregnancy and to the presence or absence of toxaemia.

S. Devenish Meares

69. **Water Metabolism in Pregnancy.** (El metabolismo de los liquidos en el embarazo.)

By J. R. FIRPO. *Obstet. Ginec. Lat-amer.*, **11**, 248-255. July 1953. 53 refs.

The author gives a detailed account of the metabolism of water in pregnancy, quoting 53 references on the subject, which almost amounts to a complete bibliography. He maintains that different grades of toxaemia of pregnancy are produced by disorder of the various factors influencing the complex mechanism of water metabolism. After referring to the passage of water from the plasma to the interstitial spaces causing oedema, he points out that chloride ions may also collect in these spaces, and by their osmotic pressure cells become dehydrated, and thus the different manifestations of toxaemia of pregnancy are produced, leading to eclampsia. The author suggests therefore that if large quantities of water are given, the chloride ions in the interstitial spaces are diluted, so that the osmotic balance is re-established, and the dehydrated cells (which are "like a thirsty sailor in mid-ocean") regain their water. He suggests that treatment should consist of a "salt-free" diet and large quantities of water.

Two cases are quoted—the first being a primigravida aged 23 years, who developed a blood pressure of 140/90 with oedema and albuminuria when 8 months pregnant. She was given a salt-free diet and a fluid intake of 4 litres daily. At the end of 2 weeks the blood pressure had dropped to 130/85, and the oedema had partially disappeared. She went into labour and gave birth to a live baby.

The second case reported is that of a para-l, aged 38 years, who, at 7½ months gestation had a blood pressure of 200/145 and marked oedema. Eclampsia occurred, and also anuria. She was given fluids subcutaneously and by mouth in large quantities, and by the end of 3 days the blood pressure had dropped to 160/105.

John F. Foulkes

70. **Circulation in the Maternal Placenta of Primates.**

By E. M. RAMSEY. *Amer. J. Obstet. Gynec.*, **67**, 1-14. Jan. 1954. 15 figs. 23 refs.

This work was done in the Carnegie Institution of Washington and is a study of the placentas of 23 rhesus monkeys (*Macaca mulatta*) at various stages of pregnancy from the 4th week till term in the hope that it might elucidate obscure or disputed matters concerning the circulation in the human placenta. At the desired day of pregnancy the animal was anaesthetized and India ink injected via a cannula in the aorta. When the injection was completed the anaesthesia was deepened till it died. The entire reproductive tract was then removed, fixed, and embedded in celloidin preparatory to serial section. In addition 3-dimensional reconstructions of representative specimens were prepared.

The main conclusions are: (1) during the progestational phase of the cycle the coiled arteries of the endometrium grow rapidly towards the lumen of the uterus and at the same time become increasingly coiled. When implantation occurs the invading trophoblast effects an opening of the arteries into the intervillous space. After the 53rd day the arteries undergo little change till the 90th day when the uterus undergoes conversion (Reynolds, *Amer. J. Obstet. Gynec.*, **53**, 901, 1947)—the phenomenon which occurs when uterine accommodation of the ovum ceases to be effected primarily by uterine growth, and begins to be on the basis of uterine stretching, the uterus being then converted from a spherical to a cylindrical form. Concomitant with this conversion the spiral arteries are paid out and straightened, so that their course is now a smooth direct one, interrupted only by an occasional right-angled bend, and so they continue till term; (2) the veins are also eroded by trophoblast and open into the intervillous space nearly a week before the arterial communication is established. As they are not coiled they can only accommodate themselves to conversion by stretching which narrows their channels; (3) the author has no doubt that in the monkey there is a marginal sinus in the placenta. It seems, however, only to play the role of a diverticulum or safety reservoir interposed in the course of the blood flow—no evidence was found to support Spanner's view that the venous drainage of the placenta is almost exclusively a direct drainage through the marginal sinus to the maternal veins in the endometrium. Instead it is shown that numerous centrally placed basal veins convey the main part of the venous flow leaving the placenta. At least half of the venous drainage of the placenta is by these central veins.

F. J. Browne

71. **A Method of Placental Localization by Lateral Radiography of the Gravid Uterus.** (Une méthode de localisation placentaire. La radiographie latérale de l'utérus gravide.)

By P. GUILHEM, A. PONTONNIER, R. BAUX and R. COMBEL. *Gynéc. et Obstét.*, **52**, 474-478. 1953. 4 figs. 12 refs.

With soft tissue X-rays the contour of the two borders of the uterus can be clearly defined in lateral films and the placenta usually being inserted, at any rate in part, either into the posterior or anterior surface, appears in the shape of a cross as a definite thickening.

The technique demands not only an excellent apparatus but a radiologist well experienced in X-rays of soft parts. In order to obtain a shadow equally interpretable from the anterior and posterior aspect the solution of the problem depends on a filter. The writers have used a filter which is partly composed of plastic and partly of baryta (Barium oxide). This filter varies in absorption and is intended to balance the blackening of the image on the X-ray film.

The position of the woman may be either lying on her side or more often standing provided that position is used which applies the foetus most firmly to the anterior uterine wall, always avoiding if possible accumulations of amniotic fluid at the point of contact. Foetal movements should be reduced as far as possible by making the patient take deep breaths just prior to exposing the film.

False placental shadows. Only films in the last few

weeks of pregnancy should be relied on in case of confusion with false amniotic fluid shadows. The authors have excluded the possible error by taking films with the mother first in the standing position and then lying down —the films can then be superimposed. The opacity of the iliac crests may prevent correct interpretation; if this is suspected, arteriography can be carried out, or calculations can be made of the distance between (1) the foetal head and symphysis and (2) foetal head and promontory.

Precision of localization depends on the technique and experience of the radiologist.

In the last trimester of pregnancy, where ante-partum haemorrhage has occurred, insertion of the placenta in the lower segment can be eliminated with certainty and an idea of the importance of the degree of placenta praevia can be estimated by the degree of associated displacement of the foetal head. In the absence of haemorrhage the technique has a wider use particularly where there is abnormal presentation, i.e., where the head is high or displaced for no apparent reason.

David Maxwell

72. **Patterns of Sodium and Water Metabolism During Ion Exchange Treatment of Preeclamptic Toxaemia.**

By R. R. DE ALVAREZ, E. K. SMITH and H. W. BARBER. *West. J. Surg. Obstet. Gynec.*, **62**, 71-83. Feb. 1954. 11 figs. 23 refs.

The authors, in the University of Washington School of Medicine, present the results of treatment in 61 patients with pre-eclampsia. Twenty-three patients were treated with 48 g. carbo-resin a day and the remainder with 96 g. a day. The resin was given for 4 days followed by a rest of 4 days and in some cases the resin was repeated for a further 4 days. All patients were kept on a low sodium diet (750 mg. a day), fluids were forced to 4,000 ml. daily and bed rest in hospital enforced. Fluid intake and output was recorded and daily estimations made of the serum and urine sodium, potassium and chloride concentrations. The blood urea nitrogen was also estimated before and after treatment. A complete metabolic balance study was made on 1 normal patient during the antenatal period and for 6 days post-partum. The results indicate that for the first 2 days of treatment the urinary sodium decreased markedly during treatment, the minimum occurring in days 3 and 4 but the effect persists while the resin remains in the bowel. The decrease on 96 g. daily was very marked and persisted even during the rest period. The patient who underwent the complete metabolic balance received 75 g. a day and the results indicate that the urinary excretion only accounts for 30 per cent of the total excretion of sodium when resin is administered. The serum sodium was not greatly affected by the administration of resin and the results indicate that only excess body sodium is removed with a dosage of 48 g. a day; above this level there is a danger of hyponatraemia developing. In the 48 g. group there was no diminution in the urinary volume but the volume declined in the 96 g. group. The administration of resin does not appear to alter the water balance of the body but does cause a change in the distribution of the water loss, an increased loss in the faeces being the most marked change. The results in the metabolic study patient showed that the resin had a pronounced effect in removing water from the body. The authors conclude that the optimum dosage of resin is 48 g. a day and that whenever sodium diuresis occurs, whether gastro-intestinal or renal, an accompanying but not proportionate diuresis of water also occurs.

[The original paper should be consulted for all the details about water and sodium balances.]

D. C. A. Bevis

73. **Allergy—A Factor in Abortions: Report on 2 Cases.**

By J. H. HERROD. *Amer. J. Obstet. Gynec.*, **66**, 1168-1171. Dec. 1953. 16 refs.

The author briefly reviews the evidence, experimental and laboratory, that histamine may cause abortion and abruptio placentae, and reports 2 cases. In both the patient had had several abortions and no living child. In their present pregnancies uterine cramps and bleeding in the early weeks were not relieved by morphine but ceased at once after intravenous administration of antihistamines. The pregnancy in each case continued and a living infant was born.

A large group of pregnant women should be studied with histamine and histaminase determinations to find if changes can be detected before symptoms appear, and what changes occur with the use of antihistamines, before any final conclusions can be drawn.

F. J. Browne

74. **Cyclic Ovarian Function Following Spontaneous Abortions.**

By R. L. HALLET. *Amer. J. Obstet. Gynec.*, **67**, 52-55. Jan. 1954. 2 tables. 2 figs. 8 refs.

Repeated biopsies were taken by biopsy curette at intervals after spontaneous abortion from 54 patients until a normal pre-menstrual secretory endometrium was obtained. Habitual aborters and patients with systemic disease were excluded. Of the 54 women, 42 (78 per cent) had a normal secretory endometrium before the onset of the first post-abortal menstrual period; 5 had an inadequate secretory endometrium, and 7 had initial anovulatory cycles. In all those who did not have a normal secretory endometrium before the initial period the second period was preceded by a normal pre-menstrual secretory phase. In those who had a normal secretory endometrium the average duration of amenorrhoea after the post-abortal curettage was 36 days. In the others it was somewhat less.

F. J. Browne

75. **Etiology and Management of Hypofibrinogenemia of Pregnancy.**

By C. P. HODGKINSON, R. R. MARGULIS and J. H. LUZADRE. *J. Amer. med. Ass.*, **154**, 557-561. Feb. 13, 1954. 11 refs.

Hypofibrinogenemia resulting in incoagulable blood may occur in abruptio placentae and in prolonged retention of a dead foetus in an Rh-isosensitized mother.

A case of abruptio placentae is described which was followed within 2 hours by haemorrhages from the gums and intestinal tract associated with a blood fibrinogen of zero. Recovery followed and the blood fibrinogen returned to normal after two separate transfusions of 500 ml. of whole blood. In cases associated with a macerated foetus the onset of hypofibrinogenemia is more gradual. Two cases of this type are described in Rh-isosensitized patients. In the first, transfusion of 4,000 ml. of whole blood and 1,500 ml. of plasma failed to control post-partum haemorrhage after the uterus had been packed, and the patient died on the fourth day from lower nephron nephrosis. This case occurred in 1947 before the significance of hypofibrinogenemia was appreciated. In the second case, where hypofibrinogenemia was proved, recovery followed treatment by whole blood transfusions and the administration of corticotrophin and protamine sulphate. In both these cases the placentas were degenerate, but a third case of this type is described where the placenta was normal and there was no evidence of hypofibrinogenemia or excessive blood loss in spite of proved Rh incompatibility and intrauterine death. The authors suggest that the development of hypofibrinogenemia in cases of foetal maceration to some extent depends upon autolysis and degeneration of the placenta.

Until preparations of fibrinogen are commercially available obstetricians must depend upon whole blood transfusions in the treatment of hypofibrinogenemia, The critical level of blood fibrinogen appears to be about 90 mg. per 100 ml. Cortisone is said to decrease fibrinolytic activity and may prove useful in certain cases. Blood should be available in adequate amounts before Caesarean section is undertaken in the presence of hypofibrinogenemia, and hysterectomy when coagulation defects have reached a critical level is extremely hazardous.

D. W. James

76. **Rh Iso-Immunization.**

By H. L. Gainey, K. S. Nicolay, J. E. Keeler and M. E. Doyle. *Obstet. and Gynec.*, **3**, 141-149. Feb. 1954. 6 tables. 25 refs.

It has been suggested that, whilst the presence in the maternal blood of Rhesus antibodies is not a cause of abortion, there is an increased abortion rate in mothers who in later pregnancies have antibodies in their blood. The authors of this article believe that manipulations such as surgical evacuation of the uterus damage the placenta and allow foetal blood to get into the maternal bloodstream. Thus, the mother becomes immunized. Similar traumatic procedures such as manual removal of the placenta, induction of labour, Caesarean section and even electric-shock therapy in pregnancy may have the same effect. The authors claim that trauma may be a cause of patients developing Rh immunization and they make a plea for the minimum of operative interference in women known to be Rh negative who are pregnant.

J. G. Dumoulin

77. **Concerning the Diagnosis of Hydrorrhoea Gravidarum.** (Over de diagnostiek van hydrorrhoea gravidarum.)

By A. C. N. Kruseman. *Ned. Tijdschr. Verlosk.*, **53**, 24-37. 1954. 42 refs.

The author applies this term to the loss of non-sanguineous fluid from the uterine cavity without the onset of labour. He describes a case, admitted for premature rupture of membranes, in whom a serous fluid was found to be exuding through the cervix. An intermittent loss of such fluid continued for 2 months before the delivery of a normal male infant. The placenta contained an incompletely encapsulated angioma which for obscure reasons was regarded as "incidental".

This case is used as a point of departure for a review of the literature on the subject from which it appears incidentally that the only English writing with a direct bearing is an article by J. Goodall in *Surg. Gynec. Obstet.*, 1931, **53**, 820. The author distinguishes four different pathological entities under the generic name of hydrorrhoea gravidarum. Hydrorrhoea uteri gravidi amnialis is the well known loss of liquor amnii found after premature rupture of the membranes. Hydrorrhoea uteri gravidi decidualis occurs as the result of hypersecretion of the decidua. The cause of such hypersecretion is obscure, but there is some evidence that psychosexual influences as well as chronic endometritis of inflammatory or degenerative origin may have some effect. A third type is the exocoelomic hydrorrhoea where a collection of fluid takes place between the amnion and the chorion. Presumably in such cases the amnion is closely applied to the foetus and fluid transuding from the amniotic cavity to the maternal circulation accumulates between the membranes. Finally there is a form of hydrorrhoea gravidarum associated with a chorion-angioma.

In practice it is clearly of importance to be able to distinguish between ruptured membranes and other causes of hydrorrhoea. In this context analysis of fluid obtained by aspiration of the vagina is of most value. Decidual fluid is as a rule found to be slimy with a specific gravity in the neighbourhood of 1·002, very little reducing power, no protein, very few leucocytes, no urates and a moderate amount of calcium phosphate. Characteristic of amniotic fluid is its watery consistency, urate crystals, pavement epithelium cells, vernix caseosa and lanugo hairs. It is seldom possible to obtain such fluid in sufficient quantity for convincing analysis, but a useful lead is often to be got by staining a drop on a slide. Foetal epidermis or lanugo hair can often be demonstrated. Pathognomonic of amniotic fluid is the orange red staining of fat droplets by Sudan III. Litmus paper is of no use in distinguishing the types of hydrorrhoea as all give an alkaline fluid. *Arnold Klopper*

78. **A Case of Poliomyelitis in Pregnancy with Fatal Issue and the Medico-Legal Problem of Safeguarding the Life of the Child.** (A propos d'un cas de poliomyélite mortelle chez une femme enceinte; Le problème médico-légal de la sauvegarde de la vie de l'enfant.)

By R. Contamin and Y. Mazare. *Bull. Féd. Soc. Gynéc. Obstét.*, **5**, 468-475. 1953.

The case concerned a woman seven and a half months pregnant whose illness started with an acute infection which was labelled influenza by the practitioner up to the time that paralysis developed in the lower limbs.

On admission a lumbar puncture was carried out; this showed a clear cerebrospinal fluid showing albumen 0·75 g. per litre; glucose 0·75 g. per litre; chlorides 7 g. per litre and 50 leucocytes per c.mm.

Rapidly respiratory troubles developed with a tendency to cyanosis and asphyxia, necessitating transferring the patient to an iron lung which brought about immediate improvement.

Gradually paralysis in the upper limbs became complete and later swallowing and speech symptoms developed. When the prognosis appeared hopeless for the mother, the only hope seemed to be to save the life of the child.

Immediate measures were taken on the spot for an emergency operation and an anaesthetist attempted to maintain regular artificial respiration.

The family of the patient thereupon flatly refused to allow any operation either ante- or post-partum. Legal authorities were then consulted on the telephone and they formally advised interference, provided the mother was dead, and there remained even a chance of saving the child. Unfortunately a few minutes later the patient died, not leaving a chance for the life of the child she carried.

The writers bring to notice this case, owing to the medico-legal aspect of the decision a surgeon may have to make in such extenuating circumstances.

Had the husband and mother of the patient the right to refuse to allow ante- or postmortem Caesarean section?

Arguments for and against ante- and postmortem Caesarean section are considered but it is unlikely in their opinion to save more than 5 per cent of babies if operation is delayed to the time of the last few beats of the mother's heart.

David Maxwell

79. Obstetric Aspects of Lower Nephron Nephrosis. A Review.

By K. P. Russell. *West. J. Surg. Obstet. Gynec.*, **62**, 66-70. Feb. 1954. 1 fig. 33 refs.

This syndrome is of great importance to the obstetrician as so many of its precipitating causes may occur in the pregnant patient; these causes include concealed accidental haemorrhage, the toxaemias of pregnancy, prolonged labour and abortion, especially septic. Ancillary causes include incompatible blood transfusion, shock from blood loss and sulphonamide sensitivity. The clinical features of the condition are frequently clouded by the precipitation condition but the occurrence of oliguria with blood-tinged urine of low fixed specific gravity usually establishes the diagnosis. Death may be rapid but conservative methods of treatment may offer hope.

[The author does not discuss treatment but appears to favour the Bull regimen (*Modern Trends in Obstetrics and Gynaecology*, Butterworth, London. p. 295).]

D. C. A. Bevis

80. Volvulus of the Cecum. Report of Five Cases.

By W. Brock. *West. J. Surg. Obstet. Gynec.*, **62**, 12-17. Jan. 1954. 5 figs. 12 refs.

Volvulus of the caecum is thought to be a rare condition but the author reports 5 cases and states that it accounts for 10 per cent of all volvulus of the intestinal tract. Its primary cause is failure of fixation of the caecum in the right lumbar gutter during development and the volvulus is usually associated with some involvement of the terminal ileum and ascending colon. Inciting factors are described and these include pregnancy and pelvic tumours which displace the caecum. Symptoms vary and may be gradual or catastrophic in their onset; pain is usually present but all symptoms depend on the degree of circulatory disturbance in the caecum. It is usually obvious that intestinal obstruction is present and the diagnosis can be suspected by radiological examination of the abdomen when a large gas-filled loop of large bowel with one fluid level is seen; its site varies and, if it is in an ectopic position, absence of the gas-filled colon and caecum is noted and small bowel may appear on the right of the mass; there is usually evidence of small bowel distention. Treatment by early operation is essential and after rotation the viability of the bowel must be carefully assessed. Preliminary aspiration of the huge segment is desirable to avoid rupture and if resection is necessary it is immaterial whether primary anastomosis or exteriorization is performed. If the patient's condition allows it, some attempt should be made to prevent recurrence by fixation of the caecum—a tube colostomy achieves both decompression and fixation. With operative treatment the mortality compares well with that associated with other causes of intestinal obstruction.

D. C. A. Bevis

81. Diabetes Mellitus and Pregnancy.

By W. N. Long, W. L. Hartmann, P. H. Futcher, and N. J. Eastman. *Obstet. Gynec.*, **3**, 160-168. Feb. 1954. 9 tables. 8 refs.

A 10-year survey of the treatment of pregnant women with diabetes comes from the Johns Hopkins Hospital, Baltimore, and includes 96 diabetic women. The criterion used was a fasting blood sugar level above 130 mg. per 100 ml. There were 118 pregnancies (20 weeks or more) and 1 maternal death. No clinic patients were offered therapeutic abortion but 32 were sterilized postpartum. The age at which patients developed diabetes and the duration of the disease were found to be important factors in the prognosis for the foetus. The authors also stress the importance of a very careful control of the blood sugar; it should be kept below 130 mg. per 100 ml. and swings in blood sugar should be avoided. The diet prescribed was 175-225 g. of carbohydrate and 100 g. protein. The weight of obese women was controlled or even reduced. Most patients required more insulin as pregnancy progressed. Only 3 patients received stilboestrol. Vaginal delivery was allowed if the diabetes was mild, labour being induced at the end of the 37th week. If there was toxaemia or progressive retinopathy or the diabetes was severe or the foetus seemed very

large, elective Caesarean section was performed. Previous infant loss was also an indication for section. The more recent treatment of the newborn infants included high humidity oxygen administration for 48 hours and nothing by mouth for this period. Antibiotics were given from birth. Glucose was used parenterally and the stomach washed out. The Caesarean section incidence was 38 per cent and the uncorrected foetal and neonatal mortality 27 per cent. In recent years Caesarean section had been more widely used with better results, and it is claimed that some of the babies which died might have been saved had section been more frequently used.

J. G. Dumoulin

82. Cerebral Complications of Pregnancy.

By B. Boshes and J. McBeath. *J. Amer. med. Ass.*, **154**, 385-389. Jan. 30, 1954. 7 figs. 11 refs.

The old idea that convulsions, aphasias, hemiplegias, and syncopal episodes during pregnancy were related solely to the toxaemias no longer obtains. Frequently they are due to pre-existing neurological disease, in some cases aggravated by the pregnancy, and occasionally as a result of medical or surgical procedures utilized in modern obstetrics. It is important to be constantly on the lookout for the small diagnostic clinical signs, and to follow these up in some cases with angiograms, radioisotopes, and electroencephalograms. Eight illustrative cases are presented:

(1) A right hemiplegia occurring 10 hours after delivery, with subsequent Jacksonian attacks. (2) Status epilepticus occurring 4 days after delivery. (3) Epileptiform seizures occurring 8 days after normal labour associated with mild hypertension. (4) Cerebral emboli following Caesarean section. (5) Massive fatal cerebral haemorrhage in a patient aged 29, after a Caesarean section performed at the seventh month of pregnancy for hypertensive disease. Autopsy revealed arteriosclerosis of the aorta and chronic pyelonephritis. (6) A subarachnoid haemorrhage subsequently brought through 2 successful pregnancies. (7) A meningioma successfully removed at the 4th month of pregnancy. This patient was later delivered of a normal child by Caesarean section. (8) A tumour of the third ventricle discovered 2 months after delivery.

Four of the 7 patients surviving developed various forms of seizures which were controlled by analeptic medication. The authors emphasize the importance of careful neurological review of unusual obstetric cases because cerebral complications are dangerous and are often the basis for a future convulsive state.

D. W. James

83. Epithelial Abnormalities of the Cervix during Pregnancy.

By B. Peckham, R. R. Greene, J. T. Chung, M. A. Bayly and H. B. W. Benaron. *Amer. J. Obstet. Gynec.*, **67**, 21-28. Jan. 1954. 1 table. 5 figs. 12 refs.

The authors believe that epithelial changes in the cervix in pregnancy are not transient "pregnancy changes" since most of them persist after the termination of pregnancy. To date they have observed 19 of such lesions in pregnancy. These lesions have been followed untreated through pregnancy and the immediate postpartum period. Of the 19 lesions, 16 have persisted. It is concluded therefore that they are not pregnancy changes but pre-invasive carcinoma.

As for the 3 lesions that disappeared the authors do not claim that they were completely removed by the biopsies, neither do they believe that the disappearance can be credited to a purported self-limiting specific pregnancy change. A similar disappearance rate is, they say, no doubt also found in non-pregnant patients.

In discussion, Danforth suggests that the lesions may have been missed in the subsequent search for them or that they were not true carcinomas in the first place.

[This paper seems still to leave the question of the significance of pregnancy changes in the cervical epithelium unsettled. Possibly the explanation of the disappearance in 3 of the 19 cases lies in the difficulty in diagnosing pre-invasive cancer for it is not easy to believe that a pre-invasive cancer ever disappears spontaneously, either in the pregnant or non-pregnant woman.]

F. J. Browne

84. A Case of Bilateral Adenocarcinoma in Pregnancy. (Adenocarcinoma ovarico e gravidanza.)

By R. Piccoli. *Minerva ginec.*, **5**, 133-134. Nov. 15, 1953.

The rarity of this condition may be gathered from the consideration that if only 3 per cent of pregnancies are associated with ovarian cysts, only 5 per cent of such cysts are malignant. Even rarer still is the case here described, where both ovaries were affected with malignant disease.

The patient was a primigravida, aged 24. The menarche occurred at 15 and the periods were normal in character. She was married on 10th January, 1952, and she had her last menstruation on 14th February. She reported early in April with pain in the right iliac fossa accompanied by swelling of the right leg. These symptoms increased but without fever or disturbance of the urinary or gastro-intestinal organs except for some constipation. Pelvic examination revealed a uterus corresponding in size to 3½ months of pregnancy fixed to an irregular mass occupying immovably between them the whole of the pelvis. Under observation the symptoms and signs briskly increased. At laparotomy on 26th June the mass was found to infiltrate the pelvic walls so extensively that only a limited subtotal hysterectomy with bilateral oöphorectomy was possible. The patient was given radiological treatment subsequently but died on 3rd November, 1952. Examination of the removed material revealed an intra-uterine pregnancy of 5 months containing a male foetus 25 cm. in length. Both ovaries were largely taken up by adeno-carcinoma, the left more extensively than the right. It is presumed the neoplasm began in the left ovary and spread to the right by metastasis. If this is so, it is remarkable that the patient's periods were unaffected and that she became pregnant so soon after marriage when the disease must already have been quite extensive in both ovaries.

W. C. Spackman

85. **Bilateral Dermoid Cysts of the Ovary in Pregnancy.** (Sul trattamento chirurgico delle cisti dermoidi bilaterali dell'ovaio in gravidanza.)

By M. Boscaro. *Minerva ginec.*, **5**, 683-689. Oct. 31, 1953. 2 figs. 85 refs.

From a review of the literature the author records 83 previously described cases of this condition and adds another which he describes in detail.

In general, ovarian cysts should be treated by surgical removal during the fourth and fifth months of pregnancy. Prior to this the ovarian corpus luteum is of functional importance, and after this date the risk of interruption of the pregnancy increases sharply. However, although the fourth and fifth months are the elective period ovarian cysts of any type must be removed as soon as they give rise to adverse symptoms. If discovered during the later months, it is recommended to do an elective Caesarean section at or near term and to deal with the cyst or cysts at the same time. (In some cases, the diagnosis during the later months of pregnancy of an ovarian cyst from a softened fibroid may be very difficult. In such doubtful cases one would prefer to allow normal delivery to occur in the absence of positive contra-indication, and to deal with the underlying tumour at a suitable time subsequently.)

In the author's case, the woman presented herself with abdominal pain at about the twelfth week of her pregnancy. A cyst of the left ovary the size of an orange was found in the pouch of Douglas, and a smaller one above the pelvic brim on the right side. Laparotomy was performed at the 14th week and both cysts were removed but it was found possible to dissect off and conserve a thinned-out piece of the right ovary not including the corpus luteum which had been developed from this ovary.

Daily estimations of pregnanediol excretion were carried out before and after operation. This fell sharply for the first 2 days following operation, during which days uterine contractions were felt and evident, but did not culminate in abortion. Thereafter the pregnanediol increased rapidly and the pregnancy proceeded to term and a normal delivery, followed by normal lactation, involution and return of regular menstruation.

W. C. Spackman

86. **Some Comments on Rupture of the Gravid Uterus.** (Algunos comentarios sobre roturas del utero gravido.)

By C. Urzaiz Jiménez. *Obstet. Ginec. Lat-amer.*, **11**, 477-483. Nov.-Dec. 1953. 2 tables. 21 refs.

In a survey of the case records at the "20th November Hospital", Yucatan, Mexico, the author found that rupture of the gravid uterus occurred 18 times in 1,800 deliveries. He contrasts this high figure with those of several other writers, who report an average incidence of 1 in 4,000. This particular hospital receives its patients from surrounding country districts where antenatal care scarcely exists, and obstetric skill is lacking. Indeed he finds that more damage is done by misdirected obstetric manœuvres than by neglect.

From this wealth of clinical material, the author classifies the causes of rupture of the uterus under three headings—(a) predisposing causes (fragile uterine wall, i.e. scars, congenital uterine malformations); (b) auxiliary causes (bad conduct of labour, disproportion and malpresentation); (c) determining causes (use of oxytocics, internal version and high forceps extractions).

Treatment of a ruptured gravid uterus in most cases is by hysterectomy, but the author claims that this is not always necessary, and that repair should be tried more often, particularly in cases of "silent rupture", and in cases where the foetus has been extracted through the abdomen. Immediate operation, methodical drainage, the use of antibiotics and careful post-operative nursing are the author's recommendations for success in cases where the uterus might be conserved.

John F. Foulkes

87. **Interstitial Bleeding. A Survey of 45 Cases.**

By L. B. Felmus and P. Pedowitz. *Amer. J. Obstet. Gynec.*, **66**, 1271-1279. Dec. 1953. 6 tables. 7 figs. 25 refs.

The 45 cases occurred from January, 1941, to March, 1953, during which time 544 ectopic pregnancies were admitted—an incidence of interstitial pregnancy of 5·3 per cent.

In interstitial pregnancy there are 3 possible terminations:

(1) Rupture, either into the peritoneal cavity or the broad ligament. This was the invariable ending in this series and contrary to the usual teaching it took place usually before the 12th week. Thus, of 44 cases in which rupture occurred, it took place before the 12th week in 35 (80 per cent);

(2) Extrusion of the gestation sac into the uterine cavity, usually followed by abortion. The pregnancy may, however, continue to term—the group designated "angular pregnancy" by Kerr and Anderson;

(3) Rarely the ovum may continue to develop in the interstitial part of the tube till term.

The symptoms differ little, if at all, from those in pregnancy in other parts of the tube, but on bimanual examination an exquisitely tender swelling may be felt in the cornu. Shock from massive intra-peritoneal bleeding seems to be much more frequent than in other disturbed tubal gestations and occurred in 71 per cent, that is 2½ to 5 times as often as for all other varieties.

Immediate operation should be undertaken. If the gestation sac is less than 8-weeks size the laceration can usually be repaired by a wedge resection, but in more advanced cases hysterectomy is preferable, repair taking too long and haemostasis being difficult because of the extreme friability and vascularity of the tissues.

F. J. Browne

88. **Histological Diagnosis of Tubal Pregnancy.**

By A. Wist. *Ann. chir. gynaec. fenn.*, **42**, 236-241. 1953. 5 figs.

The histological diagnosis of tubal pregnancy is often uncertain although the macroscopic findings appear conclusive. The author considers that this is due to the practice of taking sections through the centre of the tubal swelling. If sections are taken through the area of the periphery of the swelling, chorionic villi will practically always be seen if they are present.

D. M. Sheppard

89. Twin Pregnancy with One Intrauterine and One Extrauterine Child. (Zwillingsschwangerschaft mit intrauterinem und extrauterinem Kind am Termin.)

By A. Iklé and M. Reiniger, *Gynaecologia, Basel*, **137**, 17-32. Jan. 1954. 4 figs. 34 refs.

This paper is divided into two sections, the first clinical and the second pathological.

The clinical section contains the case report of a woman aged 22 who had had one child. In her second pregnancy she went into labour at 35 weeks and was delivered of a healthy girl per vaginam. "Thymophysin" was given to expedite the delivery of the second child; the placenta of the first child was born and exploration of the uterus revealed that the cavity was empty. Laparotomy was undertaken and the second child recovered from the peritoneal cavity. This operation was difficult as the placenta was attached to the left adnexa. The intra-abdominal twin had hydrocephalus and clubbed hands and feet. The pathological implications of these deformities are discussed and it is concluded that they arose from its abnormal situation and from deficiencies in the foetal circulation to that twin owing to the absence of the compensatory action of the myometrium. *Josephine Barnes*

LABOUR

90. The Cause of the Onset of Labour. (Actuación de la causa del parto.)

By P. Nubiola. *Obstet. Ginec. Lat-amer.*, **11**, 119-122. May 1953.

After referring to the number of theories which have been advanced to explain the cause of the onset of labour, the author draws attention to his suspicion that stretching of the tissues, when the lower uterine segment is formed, causes the production of some unidentified chemical substance from the disturbed and disintegrating decidual cells.

He took these cells from the surface of the chorion, near the cervix just before the onset of labour. In his first experiments, these were then dried, but later he used the living cells. After passing them through a solution called Tyrode (no details given), the author believes that he obtained an extract from the cells which was capable of causing irritation of the uterus. When it was injected into a rabbit's uterus, virgin, gravid or excised, the same response occurred as with posterior pituitary extract, histamine and acetylcholine.

The author states that he has also tried this product of disintegrating decidual cells successfully for inducing labour in patients at term. *John F. Foulkes*

91. The Therapeutic Approach in Cases of Ruptured Uteri Occurring during Labour. (Attitude thérapeutique dans les ruptures utérines au cours du travail.)

By H. Ezes. *Bull. Féd. Soc. Gynéc. Obstét.*, **5**, 402-403. 1953.

The obstetric clinic at Algiers under the direction of Professor A. Lafont admits numerous cases of gross dystocia.

The comparatively frequent incidence of ruptured uterus that occurs in the area concerned is bound up with three factors: (1) The inadequate nature of the uterine muscle as a result of deficient diet and the large number of cases of high multiparity. (2) The mechanical obstacles of pelvic origin. These include rickets, osteomalacia and tuberculosis. (3) Above all, ignorance and negligence.

The writer only had to refer back as far as 1946 to collect 100 cases of ruptured uterus. The cases are classified into three categories: (a) "Silent" rupture. This applies to about one-quarter of the cases; there is no indication to delay on account of the general condition of the mother. The rupture is usually in the mid-line, shows irregular edges and does not involve vascular pedicles. It qualifies in their opinion ideally for suture with interrupted nylon stitches. (b) In about two-thirds of the cases there is the classical picture of cardio-vascular collapse and shock. Shock is treated by transfusion of whole blood and plasma containing novocaine. Then a decision is made between suture and hysterectomy.

It is not apparently the writer's practice to perform hysterectomy except when suture is impossible or is likely to be unsatisfactory. Hysterectomy is particularly advised if there is a stellate rupture, if the uterine arteries are divided, if there is a broad ligament haematoma, or if the tear is grossly irregular. In the other cases, after debridement of the edges of the tear, suture is carried out which must be peritonized to prevent the possibility of intestinal obstruction.

Drainage is rarely performed but a small tube is frequently inserted for intra-abdominal instillation of antibiotics.

Not infrequently he has found it necessary to treat associated visceral lesions at the same time. These include rupture of the spleen, of hydatid cysts in the pelvis, and rupture of the transverse colon caused by the force of certain ritual manœuvres of abdominal expression!!

(c) This includes 12 per cent of cases, namely, "neglected rupture" seen several days after its occurrence. The uterus has been emptied of its contents, which lie "encysted" in the abdomen. The wound in the uterus is occluded by the neighbouring organs in the abdomen and the general condition of the woman is fairly satisfactory. In these cases, hysterectomy or marsupialization of the uterus is carried out after the removal of the blood clot and foetus.

Results: Of the 88 cases representing patients in the first two categories, 54 were treated by suture with 16 deaths, 34 hysterectomies were performed with 13 deaths and 59 patients left the maternity hospital alive, 38 of them still having an intact uterus. *David Maxwell*

92. Difficulties and Complications of the Second Stage of Labour.

By J. K. Feeney. *J. Irish med. Ass.*, **34**, 37-43. 1954.

The author presents the subject under a classification based upon cases treated in the Coombe Lying-in Hospital over the past 4 years. His classification is as follows: (1) High presenting head with failure to descend in spite of strong second stage contractions. (2) High presenting

breech with failure to descend in spite of strong second stage contractions. (3) Impaction of the presenting head in the pelvic cavity or outlet with good uterine contractions. (4) Impaction of the presenting breech in the pelvic cavity or outlet with good uterine contractions. (5) Presenting breech; difficulty with the aftercoming head. (6) Neglected shoulder presentation.

Each section in the classification is then considered and the author's views and experience of cases at the Coombe Lying-in Hospital are set out in detail.

[The subject is discussed very fully in this paper and there are many points of interest. Most of the author's views are in accord with accepted obstetric practice in this country but there are many who would disagree with the suggestion that the practitioner who has failed with a forceps delivery "may occasionally apply Kielland's forceps" when the head is lying transversely at the level of the ischial spines.] *J. K. Russell*

93. **Certain Points in Connection with Pelves with Contracted Transverse Diameters.** (Note sur les bassins transversalement rétrécis.)

By P. MAGNIN. *Gynéc. et Obstét.*, **52**, 482-486. 1953. 2 figs.

Thanks to external measurements and the impression of the anterior curve of the pubic region on vaginal examination, clinical examination can establish the probability of pelves with contracted transverse diameters, but without X-rays the degree of it cannot be defined nor its presence confirmed. The writer refers to Chassar Moir's teaching that the median transverse diameter is found on a line passing 3 mm. posterior to the cotyloid cavities.

He considers 12 cm. probably too small a figure to be termed the normal measurement of the transverse diameter of the brim. At the Obstetric Clinic of Professor Pigeaud at Lyon, 21 spontaneous deliveries occurred in 24 patients where the pelvis had a median transverse diameter equal to or more than 12·5 cm. There were two forceps deliveries and one Caesarean section and this last procedure was primarily in the interests of the baby as the woman was a primigravida of 44 with a long labour.

There were 15 spontaneous deliveries in 26 mothers in whom the transverse diameter was between 12 and 12·5 cm. One high forceps, 4 mid forceps, 4 low forceps, and 1 forceps in a tuberculous mother were necessary, also one Caesarean section when the child weighed 4,300 grammes.

Assuming that it is agreed that 12·0 cm. and not 12·5 cm. is considered the maximum figure to qualify as a transversally contracted pelvis, the writer finds the incidence 1 in 4 of all contracted pelves—actually 67 out of 257 in their series.

When the antero-posterior diameter is also contracted then the prognosis is unfavourable. When the antero-posterior diameter is greater than average, then the prognosis is good and better than when it is normal. The writer stresses the importance of distinguishing two main types of transversely contracted pelvis: (a) those with good anterior curves and (b) those with poor anterior curves and he agrees with the teaching of Caldwell and Moloy, who have tended to describe the above two categories respectively anthropoid and android. They further add that a great number of transversely contracted pelves are intermediary between (a) and (b). *David Maxwell*

ANAESTHESIA

94. **Recent Advances in Obstetric Analgesia.**

By B. E. CAPPE and I. M. PALLIN. *J. Amer. med. Ass.*, **154**, 377-379. Jan. 30, 1954.

In this paper the authors endeavour to evaluate the most promising recent methods of producing obstetric analgesia with minimal neonatal depression. Their conclusions are based upon experiences with small groups of patients at the Jewish Hospital of Brooklyn. Saddle block and caudal anaesthesia though excellent for the foetus are not without risk to the mother, a consideration which limits this method to specific indications. Intermittent inhalation of Trilene gave marked relief in 50 per cent of cases with moderate effect in the remainder. No respiratory depression in the newborn could be attributed to Trilene. Intravenous use of local anaesthetics gave slight or negligible pain relief, and toxic reactions were frequent. Two new methods seem to approach the obstetric analgesic ideal: (1) Intravenous infusion of 5 per cent alcohol in 5 per cent dextrose in water, combined with fractional injections of Benadryl gave a high degree of pain relief without neonatal depression. (2) A combination of morphine and nalorphine. The action of nalorphine in reversing the respiratory and circulatory depressant effects of morphine was studied in 75 patients. Each patient in active labour was given equal doses of morphine and nalorphine (5 to 40 mg. of each drug) and intense hypnosis and analgesia resulted. The effect on respiratory rate, blood pressure, and pulse rate was negligible. Labour progressed at a normal rate and all the infants cried spontaneously. [The value of nalorphine in reversing the respiratory depression due to morphine is generally accepted, but the authors do not state whether any obstetric complications resulted from the use of intravenous alcohol about which there have been conflicting reports.]

D. W. James

95. **Spinal Anaesthesia in Obstetrics.**

By J. C. BOREL. *West. J. Surg. Obstet. Gynec.*, **62**, 22-25. Jan. 1954. 8 refs.

The author reports the results of 9,202 spinal anaesthetics used at the Queen of Angels Hospital, Los Angeles, from 1950 to 1952. Almost all Caesarean sections are done under spinal but breech deliveries are done under general anaesthesia (ether) as it is thought that relaxation of the uterus is an advantage in these cases. In routine vaginal deliveries 40-60 mg. procaine in 10 per cent solution are injected at the level of the 3rd or 4th lumbar interspace; the injection should not be given before the

presenting part is well down on the perineum or the incidence of forceps extractions is increased. The foetal mortality was 3·1 per cent and there was a marked reduction in the mortality of premature infants, 12·7 per cent in 598 spinals compared with 24·1 per cent in 241 deliveries under general anaesthesia. No mothers died as a result of the anaesthetic and there were no permanent spinal complications. Post-spinal headache occurred in 6-10 per cent of patients but the author concludes that this minor complication is far outweighed by the more important advantages of the method.

D. C. A. Bevis

96. **Anaesthesia in Hospital Breech Delivery.**

By R. G. Law and S. G. Ransom. *Brit. med. J.*, **1**, 562-564. Mar. 6, 1954. 17 refs.

The anaesthetic requirements for breech delivery depend on the obstetric procedure to be carried out. Ideally, interference is minimal and there should be restraint in inducing anaesthesia prematurely when reliance should be placed upon the mother's expulsive powers, but a rapid and smooth induction when this is finally necessary to deliver the arms and prevent uncontrolled delivery of the head.

If there are indications for expediting delivery, the manipulations necessary in breech extraction should be rendered as atraumatic as possible by insuring good relaxation of both perineum and uterus.

Whatever the method of delivery, good oxygenation is important, as there is commonly some degree of foetal anoxia. Pethidine is not contra-indicated during the first stage, since some lessening of the sensitivity of the respiratory centre may help to prevent respiratory efforts before the mouth is free. A mixture of nitrous oxide and oxygen (75 per cent and 25 per cent) is an effective inhalation analgesic and provides good oxygenation.

The routine for assisted breech delivery at University College Hospital, London, is for episiotomy to be performed when the breech is widely distending the perineum, after local infiltration with 1 per cent lignocaine hydrochloride ("xylocaine"). After this, the breech and trunk are usually delivered by maternal effort in 2-3 minutes. When the angles of the scapulae are visible, anaesthesia is quickly and smoothly induced with divinyl ether, which is usually given in a closed circuit apparatus with oxygen and cyclopropane. The arms are brought down by Lovset's manœuvre and delivery completed with forceps to the after-coming head.

Rapid induction being of less importance for breech extraction and good relaxation essential, the best anaesthetic is ether which is safer than chloroform, the only other uterine relaxant. Foetal narcosis seldom gives rise to anxiety but, in any case, this is preferable to the increased risk of trauma if the uterine tone is not sufficiently abolished. Intravenous ergometrine given as soon as the head is born usually obviates post-partum haemorrhage from an inert uterus.

Spinal or extradural anaesthetics are not the most suitable for assisted breech deliveries and are absolutely contra-indicated in breech extraction.

Doreen Daley

97. **Spinal Anaesthesia in Caesarean Section.**

By D. W. deCarle. *J. Amer. med. Ass.*, **154**, 545-549. Feb. 13, 1954. 17 refs.

An analysis is presented of 1,236 cases at the Children's Hospital, San Francisco, from 1947 to 1952 in which spinal anaesthesia was given successfully for Caesarean section with no maternal mortality. The advantages claimed are the absence of the untoward complications of inhalation anaesthesia, rapidity of action, complete absence of detrimental effect upon the infant, and excellent muscular relaxation. A combination of procaine and tetracaine (Pontacaine) was used, with a maximum of 50 mg. of procaine and 10 mg. of tetracaine. The Pfannenstiel incision was used when possible, and it was found that a smaller dose could be used with this type of incision. Every case received routine intravenous 5 per cent glucose to prepare for the introduction of blood or further medication if required. Sudden hypotension, which occurred frequently in those cases in which blood loss was more than 500 ml., responded to one or more of the vasopressor agents. No serious neurological complications developed. Four patients suffered from persistent backache at the site of injection, 23 required repeated catheterization, and 45 complained of severe spinal headache. All the anaesthesia in this study was given by trained anaesthetists, and, although the technique of spinal puncture is simple, the authors emphasize that this form of anaesthesia is dangerous when it is administered by someone who is unfamiliar with the physiology of the drugs employed and who is not able to recognize the early signs of serious trouble.

D. W. James

98. **Twenty-four Caesarean Sections Carried out under Pentothal-Curare Anaesthesia.** (A propos de 24 césariennes effectuées sous anesthésie au pentothal-curare.)

By H. Lafon, L. Boireau and Walch. *Bull. Féd. Soc. Gynéc. Obstét.*, **5**, 448. 1953.

Routine anaesthesia has undergone several variations in order to avoid excessive blood loss from the uterine wound and respiratory depression of the newborn.

Premedication. Opiates were not given except to those mothers who have had trial labour. Premedication consists of an intramuscular injection of atropin sulphate and half a milligram of phenergan half to one hour before operation.

Anaesthesia. Just prior to operation an intravenous drip of subtosan (similar to Plasmosan) is started. 400-500 milligrams of procaineamide are injected into the tube of the drip very slowly. This is given with the idea of bringing about a certain degree of vasodilation and therefore a moderately high Trendelenburg position in the patient is adopted in order to reduce the bleeding from the uterine wound. During these procedures the patient breathes pure oxygen. When the surgeon is ready to make the incision, 60 mg. of Flaxedil is injected into the tube of the drips—also 250-350 mg. of Pentothal. The mother continues to breathe oxygen until the child is delivered. This dosage suffices as a rule until the child is delivered.

After extraction of the baby, the mother is given a

mixture of 60 per cent nitrous oxide and 40 per cent oxygen. Pentothal and Flaxedil are both given as required. Immediately after delivery 5 units of pitocin are given intravenously and at the end of the operation a pitocin drip containing 5 units to 250 ml. of glucose saline is substituted for subtosan. The total dosage is between 600 and 800 mg. of Pentothal and 100-120 mg. of Flaxedil. As soon as the patient wakes up 10 mg. of morphine or one ampoule of Pantopon is beneficial.

The writers prefer this anaesthesia as they have had absolutely no trouble with any of the babies. The operation is associated with much less blood loss than with inhalation anaesthesia. There is, however, slightly more blood loss in their opinion than that conducted under spinal anaesthesia. There was no evidence of shock even in those mothers who had had ante-partum haemorrhage. There were no ill-effects seen in the puerperium of these patients.

D. Maxwell

LACTATION

99. Clinical and Chemical Studies in Human Lactation. I, II and III.

By F. E. HYTTEN, *Brit. med. J.*, **1**, 175-182. Jan. 23, 1954. 11 figs. 27 refs.

The author, from the Midwifery Department, University of Aberdeen, has endeavoured to collect milk samples under standard conditions, and to estimate both variation in major constituents during a feeding and diurnal variation in major constituents. To empty the breasts, the recently devised breast pump—the "Humalactor"—was used, as this seemed slightly more effective than expert manual expression, and more comfortable than other breast pumps.

In a study of 83 subjects, made in 1948-9, the average milk yield on the 6th day judged by test weighing the baby was 441·3 ml.; manual expression in the same group on the 7th day yielded an average of 379·6 ml. In a series of 85 subjects from the current study, the average 6th day yield was 419·8 from test weighing and strippings. On the 7th day the yield from the Humalactor was an average of 445 ml. There was no difference in fat content of the 7th day milk in the two series, which suggests that in both series the breasts were equally well emptied. Probably manual expression, either from its discomfort or lack of normal stimulation, produced a diminished secretion.

By using the Humalactor, a consecutive series of 12 ml. samples was obtained until the breast was emptied. The fat, lactose and nitrogen contents were estimated. A rise in fat concentration always occurred, but with considerable variation in regularity and degree. There was a slight but steady fall in lactose, probably dependent on the fat rise. The total nitrogen fell during a feed in the first few days, but as the milk matured there was a small increase due to a rise in the casein concentration.

The author suggests that the rise in fat content is due to the mechanical phenomenon of adsorption of the fat globules to the large secretory and duct surfaces, and reproduced this by soaking a rubber sponge in breast milk for 4 hours, allowing the excess to drain, and then emptying it by a plunger and collecting consecutive samples.

Finally, the author attempted to investigate the diurnal variation in major constituents of milk and to discover to what extent any single feed is representative of the whole day. Forty-nine 24-hour samples were collected from 42 patients by the Humalactor at the usual feeding times. The yield at 6 a.m. was significantly greater than at the other feeds. There was a significant rise in fat content to a high 10 a.m. peak.

The other major constituents showed no systematic change. The reason for the substantial variation in fat content remained obscure. It was clear that the total daily output of fat could not be assessed accurately from analysis of any single feed.

Eileen Wilson

100. Clinical and Chemical Studies in Human Lactation. IV and V.

By F. E. HYTTEN, *Brit. med. J.*, **1**, 249-255. Jan. 30, 1954. 10 figs. 6 refs.

The author, from the Midwifery Department, University of Aberdeen, investigated the trends in milk composition during the course of lactation, and the individual differences in composition of milk. He examined 24-hour samples from 210 patients in the first two weeks of lactation, a further 150 samples on the 7th day, and 30 samples of mature milk from the 21st day or later. The whole contents of both breasts were removed by the "humalactor" at the usual four-hourly feeding times.

The range in volume of secretion was too wide to be of any value. There was a rapid drop in nitrogen value in the first 3 days followed by a more gradual decline until the end of the first month. This fall is not satisfactorily explained.

The lactose content showed a rise in the first week, with wide fluctuations. The value thereafter became more stable and the value of 6·9 g. per 100 ml. appears to be the physiological norm for mature milk.

The fat content varied widely among individuals. In the four women among whom serial samples were taken, there was wide variation in the first week, but in the second there was a steady increase, which continued up to the second month. The value is stable enough by the seventh day to indicate the fat content of the mature milk in an individual case.

The author proceeded to analyze 150 samples of milk collected on the 7th day, to determine the range of individual variation in the composition of milk. There were 121 primiparae in the series. The fat content was clearly independent of volume and of lactose and protein, which were equally clearly closely related to each other, depending on the "maturity" of the milk. Since the fat content retains its wide range of values throughout lactation, it is possible for a milk of high yield yet to be too deficient in fat to nourish the infant adequately.

Eileen Wilson

101. **The Secretion of Drugs in Milk with special reference to Tromexan.** (Über die Ausscheidung von Arzneimitteln, insbesondere von Bis-3,3′-(4-Oxycumarinyl)-Essigsäure-Äthylester (Tromexan) in die Milch.)

By M. A. CHRIST, *Gynaecologia, Basel*, **137**, 32-50. Jan. 1954. 43 refs.

A survey is given of the passage of substances given to the mother into human milk. In the case of most drugs the quantity found in the milk is unimportant and does not constitute a danger to the infant.

In the case of dicoumarin derivatives, however, special care is needed. These substances pass readily into the milk and may affect the infant at a time when the prothrombin index is already low. Liver damage may result and this has been observed in 2 of the author's cases.

A spectrographic method for the estimation of Tromexan has been developed and this has made possible the detection of very small amounts of this substance in body fluids such as milk.

It is concluded that Tromexan and other dicoumarin derivatives should not be given to puerperal women who are feeding their infants. *Josephine Barnes*

102. **A Study of the Resistance to Antibiotics in Cases of Breast Abscess.** (Etude de la résistance aux antibiotiques dans les abcès du sein.)

By R. GARMIER. *Bull. Féd. Soc. Gynéc. Obstét.*, **5**, 475-477. 1953.

The incidence of breast abscess has undergone a cyclical change in the last 10 years. After the epidemics encountered during the war which were little influenced by the sulpha drugs, their incidence returned to normal. They were relatively infrequent in 1946 and 1947, probably owing to the introduction of antibiotics.

The effect of penicillin was brief, however, and in 1949 and 1950 the curve of incidence rose to a new maximum. Aureomycin brought down rapidly the numbers of complications and at the present time the height of the curve is distinctly low. On the other hand, contrary to the impressions at the start of its use, aureomycin insensitivity is becoming more definite and a new recrudescence of morbidity is envisaged.

With these facts in view, the writer made a systematic study over a period of 8 months of pus from 19 breast abscesses, determining the resistance of the organisms to the various antibiotics.

Organisms

One case was sterile; all the others grew pure staphylococci or staphylococci associated with streptococci (1 case) or with enterococci (1 case).

Resistance to Antibiotics

All the bacteria revealed total resistance to penicillin except one. It is noted, however, that this resistance to penicillin is not universal especially in the light of English and American work which has shown good results with this antibiotic.

Aureomycin was active in 7 cases, limited in 1 case, and inactive in 11 cases. Terramycin was successful in 9 cases, limited in 4 and inactive in 6. Terramycin is therefore slightly superior to aureomycin. Chloramphenicol had action in all the cases, but its action was limited in 4.

The ideal should be to identify the organism concerned and its sensitivity and this is easy at the stage of suppuration. In order to take steps really early, culture of the milk at the earliest sign of breast infection was originally recommended. According to the writer's experience, however, contaminating organisms are always present. In 20 specimens of milk drawn off with the greatest precautions by expression or breast pump, in absolutely healthy women, culture in all cases showed pathological organisms. This examination of milk, therefore, in his opinion is valueless.

He concludes that the only practical action to take in such cases is a semi-empirical treatment, based on bacteriological facts for a given environment at a given time. Naturally the treatment must always be as early as possible as later the altered circulation will not carry sufficient of the antibiotic in high concentration to the tissue concerned.

In short, when antibiotics are used after incision (e.g., multiple abscesses, persistent temperature), a knowledge of the pattern of sensitivity to antibiotics indicates the drug of choice, and justifies the use of small incisions, often without counter-incisions. Healing is rapid and surgical reintervention has not been found necessary. He has never had to re-operate on any single case.

D. Maxwell

OBSTETRIC OPERATIONS

103. **Operative Obstetrics.**

By J. PARKS. *West. J. Surg. Obstet. Gynec.*, **62**, 61-65. Feb. 1954. 7 refs.

The author, from the School of Medicine, George Washington University, reviews the progress made in operative obstetrics by the application of modern medicine and surgery to the problems of delivery. He advocates a central episiotomy when this is required as post-operative pain is less than with the postero-lateral incision; a continuous suture of 3/0 catgut is put in the vaginal mucosa and the fascia and levator muscles approximated by interrupted sutures of the same gauge. No knots are placed in the area of the fourchette or beneath the skin and, if care is taken with the deep sutures, no skin sutures will be required. Post-delivery oedema is avoided by the use of an ice-pack to the perineum and subsequent care is directed at keeping the perineum clean with soap and water, no antiseptics, douches, etc., being needed. In tears involving the rectum a Lembert suture of 3/0 catgut approximates the submucosa and the sphincter is repaired with interrupted sutures; the rest of the tear is repaired as above and no rectal tubes, suppositories, enemata, etc., are used. Activity is not restricted.

In forceps extractions a posterior position should not be corrected by forceps rotation and a mid-forceps

extraction may often be avoided by caudal anaesthesia and a pitocin drip. This obviously requires care but he is emphatic that many midforceps deliveries can be avoided by consideration of malpresentation and uterine inertia. If the midpelvis is contracted, Caesarean section should be employed. In breech presentations the use of extraction is deprecated and a plea made for merely assisting delivery. Traction must never be applied to the foetal shoulders as brachial plexus injuries will almost certainly result. In the breech delivery of a premature infant, contraction of the lower uterine segment round the foetal head may be prevented by the insertion of a bag when the cervix is 3-4 cm. dilated; this causes complete retraction of the lower segment and full dilatation of the cervix before the child is delivered. There is rarely any reason to hurry with the delivery of an infant during Caesarean section and the incision used in the uterus is an operator's choice. Care should be taken during the delivery of the foetal head and pitocin given intravenously immediately after this; the resultant contraction of the uterus will safely deliver the rest of the infant. The cord should not be cut until it ceases to pulsate, an important point in the delivery of premature infants. The placenta is permitted to deliver spontaneously and the uterus explored for lacerations and placental fragments; care is taken to ensure that the cervix is fairly well dilated and if necessary it is opened from above with ring forceps. In Caesarean section for placenta praevia the uterus is always packed and the packing removed in the morning of the first day after delivery. The uterine incision is closed with a continuous through and through suture of 2/0 chromic catgut, care being taken to approximate the fascia.

The author concludes that a truly successful operative procedure always leaves the mother, as well as the physician, with a healthy sense of achievement.

D. C. A. Bevis

104. **Preliminary Report on a Modification of the Obstetric Forceps.**

By W. D. CUNNINGHAM. *Med. J. Aust.*, **1**, 81-82. Jan. 16, 1954. 4 figs.

The modification consists of rubber bags modelled to be slipped on, and therefore to fit each blade of any Simpson or Neville Barnes type of forceps. They are used for the mid-forceps operation. The lateral outer side is of smooth non-elastic firm fabric-impregnated rubber and the medial inner side is of rubber and is inflatable.

At the proximal end emerges a fine rubber tube connected, after the forceps have been applied, to a mercury pressure manometer and a sphygmomanometer bulb, with a screw clip for closing the circuit. The bags are inflated to a pressure of four centimetres of mercury and the circuit closed.

The modified forceps have been used on 12 unselected cases with satisfaction. It is claimed that the modified forceps, by delivering the force over the full area covered by the blades, maintain the elasticity of the baby's skull, do not interfere with the plasticity of the skull and prevent dangerous degrees of distortion.

S. Devenish Meares

INFANT

105. **Nalorphine in the Prevention of Neonatal Asphyxia due to Maternal Sedation with Pethidine.**

By S. J. PATERSON and F. PRESCOTT. *Lancet*, **1**, 490-493. Mar. 6, 1954. 4 tables. 17 refs.

The authors have investigated the effects of nalorphine injected into the umbilical vein of babies born of women who have been given pethidine or Omnopon during labour. Nalorphine antagonizes the pharmacological actions of morphine and reverses the respiratory depression due to this drug and its derivatives and also that caused by synthetic drugs with similar action such as methadone, pethidine and lephorphan. The authors stress that nalorphine is ineffective in combating respiratory depression due to barbiturates, anaesthetics and physiological causes. In the present trial, 203 infants of mothers given pethidine or Omnopon during labour were observed immediately after delivery before the cord was cut. If the child did not gasp within 10 seconds, nalorphine 0·5 mg. was injected into the umbilical vein. The contro series consisted of 212 infants delivered of mothers receiving either pethidine or Omnopon. No nalorphine was given to these babies. Neonatal asphyxia occurred in 34 (16 per cent) of the 212 babies of the control series and in 28 (13·8 per cent) of the 203 infants of the treated group. Of 21 controls for whom the information is recorded, 8 (28 per cent) cried within 4 minutes whereas 16 (57 per cent) of the 28 treated babies cried within 4 minutes. Active resuscitation in the form of oxygen, analeptics and artificial respiration was needed in 31 (91 per cent) of the 34 control babies with asphyxia neonatorum whereas it was needed in only 12 (43 per cent) of the 28 treated babies. The point is made that not all cases of neonatal asphyxia are due to maternal sedation. The use of nalorphine, however, should permit the increased use of morphine, pethidine and other related drugs during labour.

H. H. Fouracre Barns

GYNAECOLOGY

106. **Physiological Salpingitis.**

By S. NASSBERG, D. G. MCKAY and A. T. HERTIG. *Amer. J. Obstet. Gynec.*, **67**, 130-137. Jan. 1954. 7 figs. 4 refs.

Of 69 patients who had hysterectomy and salpingectomy at the time of menstruation, 43 showed some degree of inflammation of the tubes. The inflammatory reaction was characterized by polymorphonuclear leucocytes in the lumen of the tube, in the stroma of the plicae, but only rarely in the muscular wall. Also the plicae showed oedema, stasis of leucocytes within their capillaries and dilatation of lymphatics. The inflammation was for the most part confined to the mucosa though occasionally the inner portion of the muscularis was affected. Signs of chronic inflammation were not found, and the mucosa showed no evidence of healed follicular salpingitis, infiltration by lymphocytes or plasma cells, or fusion of the tips of the plicae. The majority of the cases occurred

in the mid-menstrual period, that is, in the second and third days of the period. Red blood cells and haemoglobin debris were found in the lumen of the tube but no bacteria were found in the lumen or elsewhere. All the patients had elective operations, and none of them showed clinical evidence of infection before operation. In a control group of several hundred cases this inflammatory reaction was not found in the tubes associated with proliferative or secretory endometrium of the remaining 23 days of the cycle. It is suggested that the cause of the inflammation is related to regurgitation of toxic menstrual blood into the tubes during the menstrual period. *F. J. Browne*

107. **Anterior Ocular Ovarian Grafts in the Rabbit: A Potential Tool in Endocrine Investigation for Clinician and Scientist.**

By J. E. WARD, H. L. GARDNER and B. L. NEWTON. *Amer. J. Obstet. Gynec.*, **66**, 1200-1206. Dec. 1953. 4 tables. 3 figs. 31 refs.

Ovarian implants are inserted in the anterior chambers of the eyes of rabbits, preferably albinos (technique described) and used for pregnancy tests. Of 54 tests performed on patients from the 4th to the 36th week of pregnancy, 81·5 per cent were positive, the basis of the positive test being the appearance of haemorrhagic follicle.

It was found, too, that injection of 5,000 i.u. of equine oestrogens daily for 6 days made the ovarian graft completely refractory to gonadotrophic stimulation. Reasons are given for believing that this is due, not to chemical neutralization of the gonadotrophin by oestrogen, but to a direct action of oestrogens on the ovary. *F. J. Browne*

108. **Fatal Ovarian Haemorrhage.** (Tödliche Ovariumblutung.)

By I. G. FAZEKAS and A. JAKOBOVITS. *Gynaecologia, Basel*, **137**, 87-94. Feb. 1954. 1 fig. 51 refs.

A case is reported where fatal intraperitoneal haemorrhage occurred from the left ovary in a woman aged 22. The haemorrhage took place at the time of menstruation while the woman was at rest in bed and there was no history of trauma. The patient arrived at hospital pulseless and died in spite of all efforts at resuscitation. The peritoneal cavity was found to contain 750 ml. of blood. Serial sections of the left ovary revealed that the source of the haemorrhage was a ruptured vessel beneath the ovarian capsule in the region of the corpus luteum.

The rarity of this occurrence is noted and the differential diagnosis is discussed. *Josephine Barnes*

109. **Effect of Leucotomy in Initiating Normal Menstrual Cycle at age 36.**

By J. T. HUTCHINSON, *Brit. med. J.*, **2**, 1309-1310. Dec. 12, 1953. 2 figs. 2 refs.

A case is described of recurrence of menstruation following leucotomy after 17 years' amenorrhoea.

The patient was first seen at the age of 34 years when she gave the history that she had had 2 scanty periods, separated by 2-3 months, at the age of 14, had bled twice following hormonal therapy at 17, but had otherwise been amenorrhoeic. She had always been an anxious, worrying person, preoccupied with her bowel function but at puberty she was well developed and weighed 9 stones 2 pounds. She became self-conscious about her adolescent obesity, feared to eat, worried more about the further constipation that resulted and became grossly depressed and emaciated.

On examination she was extremely tense, anxious and emaciated (5 stones 4 pounds) but, apart from some acrocyanosis of the extremities, showed no other physical abnormality. The B.M.R. was −36 and the 17 ketosteroids 3·6 mg. in 24 hours. Psychological tests showed her to be of normal intelligence with obsessive traits.

Treatment with insulin and sedatives effected some improvement in her physical condition in the next 2 months but her tension increased and an anterior lower pole leucotomy was undertaken. Post-operatively she slept, ate and opened her bowels much more normally and her weight had risen to 8 stones 4 pounds when she left hospital 2 months later. Five months after the operation it had risen to 8 stones 13 pounds and she was working away from home. Good progress was maintained but it was not until 16 months after the leucotomy that menstruation returned in June, 1952. After one 6 weeks' cycle, monthly periods became established and continued until the paper was written in February, 1953. An addendum states that, feeling so much better, she took on a more arduous post and menstruation ceased for 3 months but returned when she went on holiday. In December, 1953, she was doing a very difficult job and had not menstruated for 2 months.

The author discusses the long gap between the operation and the return of menstruation. Tension was relieved by the operation but it took time for her physique to be restored to normal. Intermittent amenorrhoea followed times of particular stress in the post-operative years. It seems that her story provides further evidence that restoration of menstrual function depends on normal nutrition and freedom from emotional stress. *Doreen Daley*

110. **Menorrhagia—Treatment with Intravenous Estradiol.**

By L. KURZROK and E. STREIM. *Amer. J. Obstet. Gynec.*, **66**, 1318-1320. Dec. 1953. 6 refs.

The authors treated 15 cases of functional acute menorrhagia with oestradiol in propylene glycol intravenously with good results. The usual dose was 10,000 r.u. daily for 2 or 3 days and bleeding generally ceased within 24 to 48 hours. The patients were usually at or about puberty, but one was aged 32. They warn against treating menopausal bleeding with hormones. *F. J. Browne*

111. **The Problem of Douching.**

By P. H. ARNOT. *West. J. Surg. Obstet. Gynec.*, **62**, 85-93. Feb. 1954.

The author briefly reviews the many treatments in use at present for leucorrhoeas in general and states that sodium lauryl sulphate and other detergents both cleanse

the vagina and render the infecting organisms more sensitive to killing agents. Household detergents are very effective in this respect and he advocates scrubbing the vagina gently with a solution of Fab, Tide, etc., followed by the insertion of a pessary containing the appropriate agent for the infection. For home treatment a daily douche of the detergent solution is used (roughly ½-1 tablespoonful of detergent to 2 quarts water) followed by the pessary. In monilial infections the douche is followed by swabbing the vagina with Berwicks dye (1 per cent brilliant green and 1 per cent gentian violet in 50 per cent alcohol) as this is more effective than gentian violet alone. Cervical erosions are treated with the electric cautery. Pruritus vulvae is treated by compresses of ice water containing ½ teaspoonful Domebro powder (a preparation equivalent to liq. alumin. acetat., BPC) thrice daily. After a few days of this treatment the patient may complain of dryness which can be relieved by Vioform cream (Ciba) or lot. calamin. The carbohydrate content of the diet must also be reduced in chronic cases.

The author concludes that modern detergents penetrate the organisms and so allow the usual medication to kill the organisms and also, if sugar-containing pessaries are used for medication, the growth of Döderlein's bacillus is improved.

D. C. A. Bevis

112. The Management of the Menopause: Artificial and Natural.

By C. L. CHAPMAN. *Med. J. Aust.*, **1**, 273-274. Feb. 20, 1954. 4 refs.

The unbalanced pituitary hormone produces the symptoms of the menopause. Eighty per cent of women experience some symptoms at this time but only about 10 per cent severe symptoms. It is important not to attribute to the menopause every symptom in a woman aged between 40 and 50 years. Some have physical ailments which have no gynaecological basis. Sometimes oestrogen is administered as a diagnostic test. In management one must study the whole life of the patient. Keep her active, maintain the health of the genital organs by the administration of vitamins C and D, and order a diet rich in protein, low in carbohydrates and fats, and poor in sodium. Administer thyroid extract.

The menopausal woman is far more sensitive to oestrogen than a normal woman so only small doses are needed. Quite small doses may produce toxic effects such as nausea and vomiting and high doses may produce uterine bleeding, painful breasts and gain in weight. Natural oestrogens are best as they have the power of producing a feeling of well being. Ethinyl oestradiol in the form of "Estigyn" is given, 0·05 milligrammes daily for 10 days; the administration is suspended for about 20 days and then recommenced. When the patient complains of persistent headaches injection of 20,000 to 50,000 units of oestradiol monobenzoate is essential every three weeks, the dose being modified as response ensues. When symptoms due to the menopause associated with haemorrhage are being treated it is best to employ combined androgen-oestrogen therapy.

In the artificial menopause the symptoms are more severe, more prolonged, and more difficult to control. In pre-menopausal women at operation healthy ovaries should be preserved. When the cervix is healthy subtotal hysterectomy should be done. When the cervix is unhealthy it should be enucleated rather than resorting to total hysterectomy.

Total hysterectomy should be reserved for malignant disease. Patients in whom an artificial menopause has been induced are younger and tolerate larger doses of hormones, and psychological treatment is of great importance.

S. Devenish Meares

113. Psychogenic Aspects of Sterility.

By I. C. FISCHER. *Fertil. and Steril.*, **4**, 466-471. Nov./Dec. 1953. 8 refs.

Psychosomatic sterility is defined as such when no pathology or dysfunction can be demonstrated by any of the methods available to us today. There is much evidence to support this premise, for we all know cases where pregnancy has followed not only adoption but the decision to adopt. The author divides such cases into 2 large groups which will be readily recognized by every gynaecologist. The first group comprises the weak, dependant and over-protected woman who is not only afraid of motherhood, but afraid of pregnancy, labour, death, or loss of figure. The second group comprises the ambitious, aggressive, career-type of woman who directs her motherly attitude towards her weaker husband, or, who being a careerist, unconsciously avoids any conflict which might result in an upset of her interests, or who is unwilling to accept the label of feminity.

As regards therapy, the author thinks that the majority of such patients can be treated by any gynaecologist who is willing to spend time, to be a good listener, and to be sympathetic and optimistic. He advises that such types of patient should be told to discontinue taking their temperatures as this increases their anxiety, for of course we have all heard of the husband and wife who find it difficult to be together according to the temperature chart. Moreover, it is important that these women should not set up house with their in-laws. Dr. Fischer suggests that some form of amphetamine at the time of ovulation will often help these women who are frequently in a state of depression.

V. B. Green-Armytage

114. A Psychodynamic Approach to the Study of Infertility.

By E. S. C. FORD, I. FORMAN, J. R. WILLSON, W. CHAR, W. T. MIXSON and C. SCHOLZ. *Fertil. and Steril.*, **4**, 456-465. Nov./Dec. 1953. 22 refs.

It is the view of the authors that just as emotional conflicts result in somatic dysfunctions, so do they equally control generative action. The authors consider that functional infertility is almost as common as the organic type, and as a result of the analysis of 32 patients they conclude that the explanation given by these women for their desire to conceive was (1) to satisfy a husband's demands; (2) to patch up a shaky marriage; (3) to be like

other women; (4) to have something of their own—that is something to love them; (5) to show their mothers how to raise a child.

They consider that a psychogenic factor is often present in the infertile woman and that this may be one of the causes of anovulation as well as a source of chronic spasm of the tubes at the cornua of the uterus. To meet the problem of this far too frequent cause of infertility they suggest a questionnaire which would help to evaluate any psychiatric factors in such women.

V. B. Green-Armytage

115. **Follicular Fluid: Its Possible Role in Human Fertility and Infertility.**

By R. KURZROK, L. WILSON and C. BIRNBERG. *Fertil. and Steril.*, **4**, 479-494. Nov./Dec. 1953. 13 figs. 6 refs.

The authors consider that human follicular fluid plays a greater role in fertilization than has as yet been realized. Since the sperm cell and ovum have a very limited life span, certainly not more than 3 days and 1 day respectively, nature arranges for the progress of the gametes towards one another in the minimal time and under the most favourable circumstances. It will be recalled by every surgeon that on opening the abdomen at mid-cycle there is always a small quantity of straw coloured fluid in the abdomen or pouch of Douglas. This is derived from the ruptured follicle. It is the view of the authors that this fluid is connected with the movement of the ovum into and through the tubes from the moment of rupture, and that fertilization of the human ovum occurs in the medium of this follicular fluid. Therefore if there be an insufficient amount of this fluid, both the ovum and the spermatozoa will be arrested in their progress.

Since Gray pointed out that the maintenance of a flow of fluid as a thin film over the surface of mucous membrane is a function peculiar to cilia, the authors presume that follicular fluid is swept into the tubes from the abdominal cavity and through the tubes into the uterus in order to provide a medium in which the cilia can oscillate and the spermatozoa swim. Moreover, they provide evidence that the sperm cells maintain themselves for a longer period and longer maximal activity in this fluid, than they do in the plasma of semen.

From these deductions it would seem that nature provides an explanation for the various diameters of the human Fallopian tube, for since the ciliated current must be slowest in the ampulla and fastest at the cornu, the rate of motion of the ovum through the tube must follow the same rule. Moreover, the energy imparted to the follicular fluid must also increase as it proceeds from the widest to the narrowest portion. These considerations support the view that the progress of the spermatozoa through the uterine cavity into the tubal opening is a guided phenomenon for when follicular fluid sweeps into the uterine cavity after rupture of the Graafian follicle, the sperm cell then and there only can swim upwards towards the source of such stream, the tubal ostium.

There would seem to be nothing inconceivable in this hypothesis which assumes that follicular fluid is an essential part of a physiological process and insists that the amount of this fluid is of superlative importance, for if the quantity is insufficient the phenomena described do not take place. Moreover, it explains the therapeutic fact which has been observed on many occasions that, if one injects large doses of pregnant mare's serum into a woman (3,000-4,000 I.U.) early in the follicular phase of the cycle, this will cause the production of large cystic follicles. In certain cases of infertility following such therapy pregnancy will occur. The authors do not think that such a result is so much caused by the fact of ovulation, as by the quantity of follicular fluid which is carried through the tube into the uterine cavity at the time of ovulation. In 47 patients one-half a c.cm. of a watery suspension of oestrogens (25,000 I.U.) was instilled directly into the uterine cavity at the time of ovulation. The introducing cannula was fitted with an olive to the cervix which retained the solution for 5 minutes in the endometrial cavity. There were no reactions when this was done at the time of ovulation except moderate cramp for an hour or so. Cohabitation occurred that day and the following day. Eleven pregnancies resulted from this therapy. The conclusions from this very interesting paper are (*a*) that human follicular fluid acts as a prolonged activator and nutrient medium for human spermatozoa; (*b*) that this fluid is responsible not only for the progress of the ovum but that of the sperm cells within the female genital tracts, for, dependent upon its quantity, this fluid flows through the tube, through the tubal ostium and into the uterus where it is channelled towards the cervix; (*c*) that the passage of spermatozoa into the tubes is a directed phenomenon and not a fortuitous occurrence.

V. B. Green-Armytage

116. **Problems in Fertility and Sterility due to Ectopic Pregnancy. A Study of 259 Cases.**

By A. GRANT. *Med. J. Aust.*, **2**, 817-819. Nov. 28, 1953. 14 refs.

Less than one-third of the patients who have suffered from an ectopic gestation will ever produce a living child. Out of about 13,000 gynaecological outpatients at The Women's Hospital (Crown Street), Sydney, there were 100 consecutive women who had suffered from an ectopic pregnancy, an incidence of 1 in 130.

Only 32 per cent of these patients had been able to produce a living child since the operation, and this conforms with other published figures.

The predominant factor in the failure of these to conceive is inefficiency of the tube. In patients being treated for sterility the incidence of ectopic pregnancy was 2 per cent.

In a group of 370 patients treated for blocked Fallopian tubes by high pressure insufflation the frequency of ectopic pregnancy was 25 times that found in the normal pregnant members of the community. The recurrence rate of tubal pregnancy among patients complaining of sterility was found to be 5 per cent.

Two-thirds of patients who have previously been operated on for ectopic pregnancy were later shown to

have damage or blockage of the residual tube. Evidence suggests that this tube was damaged after the operation in about 50 per cent of cases.

No patient has been properly treated for her ectopic pregnancy until her one remaining Fallopian tube has been protected by antibiotics after operation and subsequently proved patent by the performance of a tubal insufflation.

S. Devenish Meares

117. **Frigidity in the Female.**

By J. W. JOHNSTONE. *Med. J. Aust.*, **2**, 665-669. Oct. 31, 1953. 7 figs. 5 refs.

Remarking that in Nature intercourse has arisen to bring the gametes into such close proximity that they can unite to form a zygote; and recognizing both the psychic love-component involving cortex and brain stem and the somatic pattern of impulses involving a discharge over spinal reflexes, the author discusses the local and central mechanisms in detail. Clitoral orgasm is achieved by two out of three women, the vaginal orgasm by less than half. A few can achieve both. The stimulus in the vaginal region most likely arises from proprioceptor afferents in the musculature of the region. The driving force of the central component of sexual desire is in the instinctive urges of the past but the finished pattern in the individual is derived from maturation of the psyche. During this development there may be many deflections, inhibitions, fixations and regressions.

Psychic imagery may produce the sentiments of love but without activity of the genitalia there is no concomitant effect or experiencing of feeling. Love seeks expression in lust. The sex act has become an end in itself divorced from the aim of reproduction, and orgasm may in some way be necessary for health or for the maintenance of optimum intrapsychic tension. Oestrogens have no direct erotic effect; but androgens in large doses in both sexes increase sensitivity.

The truly frigid woman has no conflict. The normally-sexed woman unable to achieve satisfaction may become frustrated and neurotic, the erotic woman who can never be satisfied psychotic. The histories of 750 private patients complaining of sterility are studied. Two-thirds knew and appreciated the meaning of orgasm, 1 in 12 found intercourse distasteful.

Secondary frigidity is a gynaecological problem resulting from disparity in size, congenital septa, deformity and hypoplasia, scarring and fissures. Primary frigidity involves the psyche, not the soma. Frigidity may result from pain, from ignorance or incapacity in the husband, from regarding sexual pleasure as a wrong, from blunting of feeling from coitus interruptus, from living with "in laws", from aversion to a particular partner, from persistent anxiety due to "honeymoon failure", from a guilt complex, from knowledge that the husband is sterile, from fear of pregnancy, from various post-partum causes and from deep distortion of the personality structure. In treatment the important first step is the taking of a history; in this the patient may require help as her vocabulary may be inadequate. Significant gynaecological lesions should be corrected. Advice should be given separately to both partners on intercourse. Androgen therapy is of doubtful value alone but may help as an adjuvant to other treatment. Some degree of psychotherapy is necessary in all cases but the gynaecologist may require help in this from a psychiatrist.

S. Devenish Meares

NEW GROWTHS OF THE REPRODUCTIVE ORGANS

118. **Survey of the Results of Treatment of Patients with Genital Carcinoma in the Women's Hospital at Basel during the years 1935-1942 and 1943-1946.** (Vergleich der Behandlungsergebnisse bei Patientinnen mit Genitalkarzinomen am Frauenspital Basel. Jahresgruppe 1935-42 und 1943-46.)

By H. ERB. *Gynaecologia, Basel*, **137**, 95-116. Feb. 1954. 8 refs.

This is a detailed statistical survey of the results of treatment in genital carcinoma at the Women's Hospital, Basel. The cases are divided into two groups, those encountered between 1935-1942 and those between 1943 and 1946. There were 489 cases in the first group and 251 in the second, though the second group included in addition Hinselmann Groups III and IV and Stadium O (carcinoma in situ), bringing the total in the second group up to 304 cases. The incidence of genital carcinoma was 4·34 per cent of gynaecological cases in the first 5-year period and 3·35 per cent in the second 5-year period.

In carcinoma of the cervix, the 5-year cure rates were as follows:

Stage I	1935–1942	46 per cent
	1943–1946	73 per cent
Stage II	1935–1942	13 per cent
	1943–1946	36 per cent
Stage III	1935–1942	3-year cure rate 3 per cent
		5-year cure rate 0 per cent
	1943–1946	3-year cure rate 20 per cent
		5-year cure rate 12 per cent

In the case of carcinoma of the corpus, the 5-year cure rate improved from 44 per cent in the group between 1937-1942 to 50 per cent in the group 1943-1946.

In carcinoma of the ovary the 5-year cure rate between 1937-1942 was 31 per cent and, in the group from 1943 to 1946, 41 per cent. The improved results are attributed to better radiotherapy and more radical surgery.

In carcinoma of the vulva, the 5-year cure rate was 27 per cent for the group 1937-1942 and 50 per cent for the group 1943-1946.

Primary post-operative mortality was 2½ per cent in the group 1937-1942 and 1 per cent in the group 1943-1946.

The absolute cure rates were:	1937–1942	28·2 per cent
	1942–1946	38·2 per cent
The relative cure rates were:	1937–1942	33·3 per cent
	1943–1946	45·3 per cent

Josephine Barnes

119. **Cancer of Uterus: Relative Incidence of Types.**
By J. W. MAGNER and W. KEARNEY. *Brit. med. J.*, **1**, 434-436. Feb. 20, 1954. 14 refs.

Carcinomas of the uterus are commonly divided into 3 groups: (1) epidermoid carcinoma of the cervix; (2) adenocarcinoma of the cervix; and (3) endometrial carcinoma of the body. The first and third groups together account for over 90 per cent of uterine carcinomas.

At the Bon Secours Hospital, Cork, during the past 4 years, 1,612 uterine specimens (1,135 endometrial curettings, 286 uteri and 191 cervical biopsies) were examined and the relative incidence of cases of carcinoma of the body and the cervix found to be 7:1. Of the 6 cases of cervical carcinoma, all but one were epidermoid.

The ratio of endometrial to cervical carcinoma is very different from that given in the textbooks. The cases were collected over 4 years, which makes it seem unlikely that the relative frequency was a chance finding and excludes to a large extent the possibility of cases of cervical carcinoma having been missed. Moreover, the age distribution and mean age of both groups are typical. Comparison with the figures of the Dublin Maternity Hospitals over the same period shows that there the usual incidence of carcinoma of the cervix still obtains and that the Cork statistics indicate an absolute decrease in their cervical cases rather than an increase in endometrial carcinoma.

It seems possible that a reason for the low incidence of cervical carcinoma might be the higher economic status of those in the Cork series. The average age at marriage was later and divorce and syphilis rare, all of which may be factors lowering the cervical carcinoma rate. The relationship of cervical tears, cervicitis, oestrin metabolism are discussed, as is the low but rising incidence in Jewish women but no definite conclusions can be drawn. It is suggested that cervical carcinoma may be produced in the poorer economic class by some unknown hormonal imbalance or by an unsatisfactory reaction, associated with poverty, to irritative lesions of the cervix.

Doreen Daley

120. **Chorion-epithelioma of the Uterus.** (Chorio-épithéliome de l'utérus.)
By M. RIVIÈRE and L. CHASTRUSSE. *Gynéc. et Obstét.*, **52**, 349-385. 1953. 10 figs. 103 refs.

The authors are in agreement with Merger who wrote from Paris in 1932: "It seems that since chorion-epithelioma was demonstrated to be foetal in origin, we are too much concerned with the foetal chorion and leave out all possibility of a tumour of maternal origin. It is not suggested that there should be a return to the sarcoma theory, but it is considered that under the name of chorionepithelioma neoplastic states that are not histologically identical are apt to be classified. Some are pure chorionepitheliomas. Others are chorionepitheliomas with associated hyperplastic decidua, the degree of malignancy of which has not been determined. Yet others are pure tumours of endometrium which must be excluded from the main group of chorionepitheliomas."

As regards pregnandiol excretion the writers refer to the work of Pigeaud of Lyon who made a study of 25 hydatidiform moles. He estimated that pregnandiol is at a constant level in the neighbourhood of that found in the course of normal pregnancies of the same age. A raised level usually implies an active hydatidiform mole and most often these cases are associated with large ovarian lutein cysts. The pregnandiol persists as a rule for 14 days after evacuation of the uterus.

Raised figures of pregnandiol in the urine following evacuation of a hydatidiform mole is an indication of possible chorionepithelioma. *David Maxwell*

121. **Endometrial Sarcoma (Two further cases).**
By O. KINNUNEN and C. VON NUMERS. *Ann. chir. gynaec. fenn.*, **42**, 250-258. 1953. 2 figs. 20 refs.

The author describes 2 cases of endometrial sarcoma of reticular structure. The first case was in a woman of 63, was diagnosed by curettage and was associated with a papilliferous cystadenocarcinoma of the ovaries. The second was in a woman of 44 and associated with a fibroid. The author considers the prognosis good on account of the radiosensitivity of this tumour.

D. M. Sheppard

122. **Relationship of Endometrial Hyperplasia and Adenocarcinoma of the Uterine Fundus.**
By E. R. NOVAK. *J. Amer. med. Ass.*, **154**, 217-220. Jan. 16, 1954. 29 refs (included in author's reprints only).

Prolonged unopposed oestrogen stimulation seems to be the established cause of the pathological entity known as endometrial hyperplasia. It may arise spontaneously during the menstrual era or in the postmenopausal patient, but a similar picture may be produced at any age by oestrogen therapy, which is often administered with complete lack of discretion. Unfortunately many complex atypical hyperplasias exist where even expert pathologists differ as to whether an early adenocarcinoma exists or not.

From the Department of Gynecology at the Johns Hopkins Hospital the author has studied the oestrogen-adenocarcinoma problem from the following angles: (1) A late menopause, over 50 years of age, with resultant prolonged oestrogen stimulation is often found among patients in whom adenocarcinoma later develops. (2) Endometrial cancer is rare after castration. (3) Previous curettement has frequently shown hyperplasia in women subsequently developing adenocarcinoma. (4) There is a high incidence of adenocarcinoma (15 to 20 per cent) in association with feminizing ovarian tumours. (5) More and more cases of adenocarcinoma are being reported in which there is a history of prolonged oestrogen therapy. (6) Postmenopausal hyperplasia and adenocarcinoma have been found to coexist by many expert pathologists.

A high incidence of ovarian stromal hyperactivity has also been found in association with fundal cancer, and it might be inferred that the postmenopausal ovary is not always the functionless organ that it has been presumed to be. A preliminary study of 35 cases suggests a relation between spontaneous postmenopausal endometrial hyperplasia, adenocarcinoma, stromal hyperplasia in the ovary, and the physical type of the patient. A large

percentage of these women are obese, hypertensive, diabetic, nulliparous, and have similar menstrual irregularities. Possibly all are simple variants of a similar metabolic process.

Although apparent cures have been reported after curettement only, the uncertainty regarding the outcome is sufficient justification for hysterectomy. Possibly in the future the interpretation of difficult biopsies may be assisted by the development of histochemical differential stains. Even if the close relation between oestrogen, hyperplasia, and adenocarcinoma is accepted it is still unjustifiable to conclude that oestrogens definitely cause adenocarcinoma for the genetic factor must still be considered. It would seem advisable however to be particularly sparing in any use of oestrogens when there is a strong hereditary background of cancer.

D. W. James

123. **Postpartum Cervical Carcinoma.**

By A. T. Daro, N. P. Primiano, H. A. Gollin and E. Nora. *Amer. J. Obstet. Gynec.*, **67**, 15-20. Jan. 1954. 3 figs. 2 refs.

This is a study of 1,500 postpartum women examined 6 weeks after delivery. All cervical lesions, erosions, polyps, eversions, etc., were subjected to biopsy, preceded by the Schiller iodine test, in order to determine if undetected cervical carcinoma, existing during pregnancy, might at this 6-week interval be discovered. Of the 1,500 women, 226 had cervical lesions, an incidence of 15 per cent. Two of these were carcinomatous, 1 of the 2 being invasive and the other pre-invasive. The future progress of the pre-invasive case is not described nor its treatment.

F. J. Browne

124. **Metastases in Bone following Cancer of the Cervix.** (Considerazioni sulle metastasi ossee da cancro del collo dell'utero.)

By G. Piozzi. *Minerva ginec.*, **5**, 730-737. Nov. 30, 1953. 4 plates. 21 refs.

It was formerly considered, according to standard opinion, that cancer of the cervix rarely gave rise to metastases in the skeletal system and that such when they occurred were usually single. Nowadays, however, numerous observations of such skeletal metastases are noticed. The further question arises as to why such metastases in distant bones are found so frequently in the course of carcinoma of other organs, the female breast, the prostate and the thyroid, for examples.

The paper discusses at some length the question as to whether the increased incidence of bony metastases can be attributed to radium and X-ray treatment. The views of various authorities appear to differ on this point, but it is evident that the slight trauma effected by intracervical application of radium could determine the opening of lymphatic and vascular channels for dissemination of carcinomatous emboli. The percentage of such bony metastases found is given from many sources and is about 1 per cent of all cases of carcinoma of the cervix.

Four examples are given from the clinic at Perugia. They occurred among 456 patients treated there for cancer of the cervix, a percentage of 0·87. The sites of the metastases were right tibia and fibula, left humerus, cuneiform of left foot, and interior of left ileo-pubic ramus (one case each).

Such metastases should be treated by radiation, especially if occurring in long bones, not with any expectation of effecting a cure, but of relieving pain and avoiding if possible the disabling consequences of spontaneous fracture.

W. C. Spackman

125. **Carcinoma of the Ovary.**

By W. H. Pearse and S. J. Behrman. *Obstet. Gynec.*, **3**, 32-45. Jan. 1954. 12 tables. 3 figs. 20 refs.

This is a study of 262 cases of primary ovarian malignancy seen at the University of Michigan Hospital over a period of 21 years. Of these, 235 were cystadenocarcinomas, 208 being listed as serous. The cases are studied in regard to age incidence, menstrual disturbance, fertility and family history. The authors point out the high incidence of a family history of carcinoma, and a decreased fertility rate. Twenty-five per cent of all cases had some abnormal vaginal bleeding. The delay from onset of symptoms to seeking medical care averaged 9·1 months. Thirty-two per cent had ascites. The authors group their cases into 4 categories (using the Helsel method of grouping). Cases in Group 1 survived an average of 45·5 months, and Group 4 9·2 months. They also give 5-year and 10-year survival rates. They point out that earlier diagnosis is the only present hope for increased survival.

J. G. Dumoulin

OPERATIONS

126. **Gynaecological Surgery via the Vagina.** (Chirurgia ginecologica per via vaginale.)

By G. Dellepiane, M. Massazza and R. Calvanico. *Minerva ginec.*, **5**, 749-797. Dec. 15, 1953.

This number of the above periodical is taken up by papers read at a Congress of Gynaecologists at Valencia in June, 1953. It presents a discussion of abdominal surgery in the female performed through the vagina under the following heads: (*a*) benign affections of the uterus including the operative treatment of prolapse, (*b*) cancer of the uterus, and (*c*) conditions of the tubes and ovaries requiring operative treatment.

(*a*) Whilst preferring the "Manchester" type of operation for prolapse of the vault to interposition operations, the writer stresses the point that in most cases the uterus never subsequently bears children, and on the contrary may be the cause of menorrhagia, dysmenorrhoea or other serious disability. Hence in a considerable proportion of cases repair operations of this type should involve vaginal hysterectomy which permits very satisfactory tightening of the tissues at the vaginal vault. In proposing such surgery many considerations must be taken into account and operative technique will depend on the age of the patient (young, periclimacteric or

senile) and on the degree of prolapse. A convenient classification is:

1st degree: the vaginal walls appear only on straining.
2nd degree: the vaginal walls, but not the uterus, appear without straining.
3rd degree: the vaginal walls with the cervix, usually elongated and hypertrophied, appear externally without straining.
4th degree: externalization complete of vaginal walls and uterus with marked hernia of the pouch of Douglas.

In degree 1 in a young patient no operation may normally be considered as indicated, whereas in an elderly patient with a severe degree of prolapse the removal of the uterus through the vagina will facilitate a sound reconstruction of the vaginal vault and its supports, whilst at the same time removing an organ which is not only useless but may be a source of inconvenience or danger. Contra-indications to vaginal abdominal surgery are listed in some detail, including uncertainties of diagnosis, adhesions, associated abdominal conditions needing surgical intervention, ectopic pregnancy, endometriosis, myomectomy, large tumours, etc.

(*b*) In cancer of the cervix uteri, the technique of Stoeckel is preferred to that of Amreich. Both derive of course from the original Schauta operation. A similar operation is suitable for cancer of the uterine body, but in cases of chorionepithelioma removal should be via the abdomen which gives a better chance in early cases.

(*c*) This section is less adequately dealt with, but the usual items such as the removal of small ovarian cysts, sterilization by tubal ligature or excision, especially during the course of other vaginal procedures, are mentioned. *W. C. Spackman*

127. Sterilization at the New York Hospital over a Twenty Year Period. 1932-1952.

By J. A. WEINBAUM and C. T. JAVERT. *West. J. Surg. Obstet. Gynec.*, **62**, 95-100. Feb. 1954. 1 fig. 16 refs.

The authors review 643 operations for therapeutic sterilization. The main indications being obstetric (192 cases) and medical (304 cases). The incidence was 0·38 per cent of the gynaecological patients treated and 0·64 per cent of the obstetric patients. Nineteen patients died (including 13 cardiac patients) and 60 had immediate postoperative complications (mostly wound and urinary infections). At least 20 different operations were employed and there were 2 failures in the group. The authors present their own modification of the operations of Taussig and Pomeroy. A loop of the isthmic portion of the tube is clamped, ligated and removed and a flap of round ligament pulled between the two cut ends and so sutured that it covers the proximal stump of the tube. They claim that this makes the operation more sure in its results (10 cases have been treated so far) and impairment of the ovarian blood supply is minimized. *D. C. A. Bevis*

128. Polyethylene in Tuboplasty.

By J. ROCK, W. J. MULLIGAN and C. L. EASTERDAY. *Obstet. Gynec.*, **3**, 21-29. Jan. 1954. 8 figs. 1 table. 14 refs.

The authors describe their experience of using pure polyethylene in surgical operations designed to maintain tubal patency at the Harvard Medical School, Boston, and the Free Hospital for Women, Brookline, Massachusetts. The polyethylene was used in several different ways, in tubular form passed through the length of the Fallopian tube and out into the vagina, as plastic film, as small solid cones which were sutured to the reconstructed tubal opening, and as a plastic hood sutured over the fimbriated end of the Fallopian tube. In some procedures a second laparotomy was necessary to remove the polyethylene. The authors believe that plastic pure polyethylene evokes little or no histological reaction in tissues and is therefore the best medium for the purpose. They point out that the proper manner of its use awaits further experimentation. They consider 108 cases in whom some plastic operation was performed on one or both tubes. In 60 patients polyethylene was used. Of the 108 cases, there were 21 pregnancies in 19 patients (4 aborted and there were 5 ectopic pregnancies).

J. G. Dumoulin

129. Some Lessons from 4,000 Utero-Tubal Insufflations.

By A. SHARMAN. *Brit. med. J.*, **1**, 239-242. Jan. 30, 1954. 24 refs.

The author discusses the conclusions he has reached after performing over 4,000 tubal insufflations in the past 25 years.

He considers that the use of any gas other than carbon dioxide can no longer be justified, in that both oxygen and air, with their slower absorption rates, carry a real risk of embolism, including reported fatalities, whereas it is accepted by physiologists that it is almost impossible to produce embolism with carbon dioxide. Moreover, there appears to be clinical support for the theoretical view that the use of air increases the chance of introducing infected material. In the series reviewed, there were 5 cases of pelvic infection following the procedure and only 2 were severe. Using carbon dioxide, the present routine practice is to perform insufflation in the premenstrual phase of the cycle when an endometrial biopsy can be usefully taken at the same time.

Criteria of tubal blockage have been variously described and the author considers that two tests with the pressure raised to 250 mm.Hg are more likely to provide a reliable diagnosis of non-patency than is the more commonly accepted pressure limit of 200 mm. used. He finds higher pressures to be safe and does not consider that antispasmodics relieve tubal spasm; in fact, deep anaesthesia seems to reduce the chance of obtaining a satisfactory result. In the event of a negative finding in an anaesthetized patient, he advises repeating the insufflation at once after cervical dilatation which may resolve tubal spasm. If a negative test is obtained under anaesthesia, another should be performed without it. Hysterosalpingograms made after negative insufflations seldom correct the diagnosis but provide strong corroboration of non-patency and will usually help to demonstrate the site of occlusion.

Statistical assessment of the therapeutic value of tubal insufflation is difficult, when coincidence cannot be

dismissed if a woman becomes pregnant soon after the procedure. The author investigated the relative value of simple cervical instrumentation by comparing the proportion of women becoming pregnant after insufflation with a similarly unselected infertile group in whom nothing more was done than passing a uterine sound. Of the 902 women with primary sterility who had had an insufflation, 30 per cent were pregnant within a year, whereas in the group of 253 patients in whom a sound was passed, only 17·7 per cent became pregnant within that time. He agrees with Rubin that it seems justifiable to conclude that insufflation exerts a therapeutic effect in some women.

A kymograph is a useful addition to an insufflation apparatus, for it may show evidence of stenosis, spasm or peritubal adhesions rather than merely indicating whether the gas has passed. The permanent record is useful and enables results obtained at different times to be compared, though tracings repeated within a few hours are not always closely similar.

Doreen Daley

130. **Culdoscopy.**

By R. W. Noyes. *Obstet. Gynec.*, **3**, 184-191. Feb. 1954. 9 tables. 2 refs.

From Stanford University School of Medicine, San Francisco, comes this report on the advantages and limitations of culdoscopy. It covers 130 culdoscopic examinations, done over 4 years, the majority by junior members of the staff under supervision. If the patient did not have a subsequent operation, she was kept in hospital for a day or occasionally longer. Local, caudal or spinal anaesthesia was used. The culdoscope was pushed through an incision in the posterior vaginal vault. The technique failed in 16 cases because of adhesions, pelvic masses or failure to find the peritoneal cavity. Of 109 patients successfully culdoscoped, all pelvic organs were seen in 56. There were 36 cases suspected of having ectopic pregnancies: culdoscopy gave 1 false positive, 2 false negative and 7 unsatisfactory results. Of the remaining 26 cases, ectopic gestation was confirmed in 5 and ruled out in 12; in 9 patients new diagnoses were established. A clinical diagnosis of chronic pelvic inflammatory disease was made in a group of 28 patients of whom 20 complained of infertility and 8 of pelvic pain. Culdoscopy was used in 26 cases of endometriosis in which the degree of diagnostic accuracy was high, and the author claims that it is an ideal method of diagnosing and following such a condition. Of 26 patients with pelvic masses the clinical diagnosis was confirmed in 13, although important specific details were often missed, and the author believes that culdoscopy is not a reliable method of elucidating the nature of painless pelvic masses. In a group of miscellaneous conditions, culdoscopy seemed to have a curative effect on some psychoneurotic patients. In summarizing, the author points out that in his series there is a failure rate in culdoscopy of 16 per cent and a misdiagnosis rate of 4·5 per cent. It neither supplants nor competes with exploratory laparotomy, but supplements surgery.

J. G. Dumoulin

UROLOGY

131. **Clinico-radiological Investigations of Urinary Incontinence in Utero-vaginal Prolapse.** (Indagini clinico-radiologiche sull' incontinenza urinaria nel prolasso utero vaginale.)

By L. Sburlati. *Riv. Ostet. Ginec. prat.*, **35**, 645-653. Dec. 1953. 12 figs. 50 refs.

Among 300 parous women with genital prolapse the author found that 95 (31·6 per cent) did not have any urological symptoms, 141 (47 per cent) had symptoms of cystitis without incontinence and 64 (21·3 per cent) had true stress incontinence. The incidence of instrumental delivery was 44 per cent in these last 64 women and 16 per cent in the remaining 236.

Cystographic examinations (antero-posterior views) were carried out before and after operation in an unspecified number of the women. The only definite result was that residual urine after voiding was absent in those without urinary symptoms and present in those who had cystitis or stress incontinence.

Operative treatment in all instances consisted of anterior and posterior plastic repair of the vagina without amputation of the cervix. Failures were not recorded.

The author believes that instrumental delivery is a major factor in the aetiology of stress incontinence, that cystographic studies are valuable in cases of prolapse and that simple plastic repair is preferable to newer methods.

M. Caturani

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Sampson, P. (1940): *Obstetrics for Midwives*. 2nd edition. Fraser, London. p. 9.

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